JULY 1925.

MECCANO MAGAZINE

PRICE 3D
VOL. X
No. 7

Famous Bridges (see page 322)

"Miss America"

The World's best value in Steam Model Launches

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Here's a tophole little launch which just buzzes through the water under her own steam. Thousands of boys are already having hours of delight with them on yacht pond or calm river. It is a three-guinea model for 12/6—beautifully finished, strong and well made.

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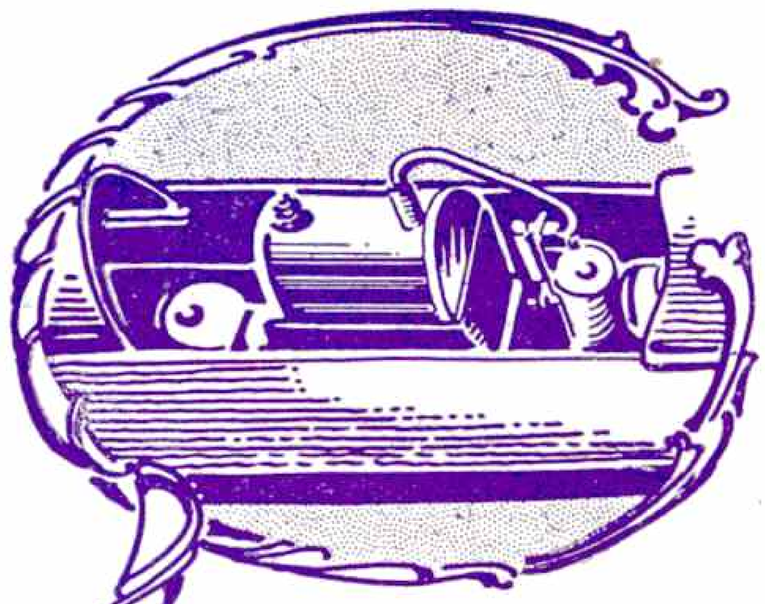
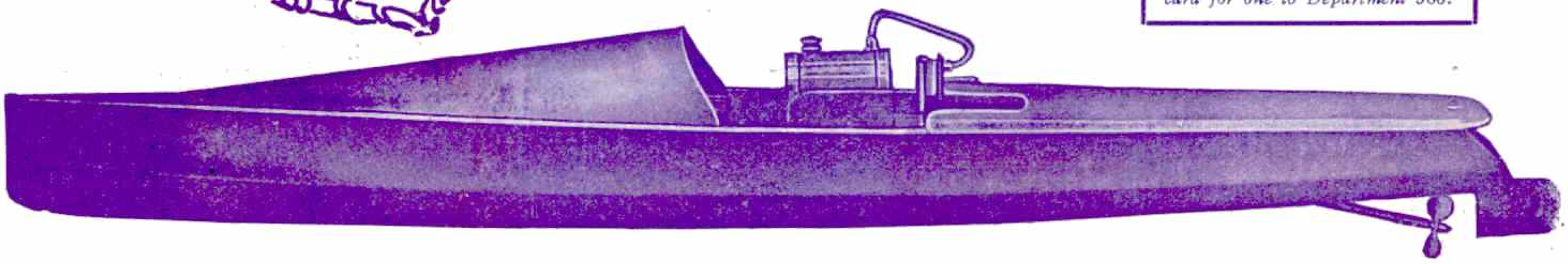


Free to Meccano Readers

A short pamphlet giving full details of the launch will be sent to any reader who sends a post-card for one to Department 960.



WHERE YOU CAN BUY THEM

Hobbies Ltd. (Miss America Department,) Dereham, Norfolk

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MECCANO MAGAZINE

PUBLISHED
IN THE INTERESTS
OF BOYS

July 1925

With the Editor

Five Generations

In writing about "Our Million Ancestors" on this page in the May "*M.M.*" I mentioned how quickly the number of our ancestors adds up with every previous generation we take into account. In this connection I see that Sir James Barr, the famous specialist, recently stated in an interview, that in the tenth generation we each have 1,024 tenth grandparents.

On the same day, in another newspaper, I read that a baby boy has been born who is the latest of five living generations. He is the son of a farmer who lives on the wild moors near Slaidburn, in the heart of the Yorkshire hills. The boy has four grandparents, two great-grandparents, and one great-great-grandfather. In this family, therefore, there are five generations now living and the boy has nine living ancestors. This surely must be a record, but if any of my 50,000 readers can beat it, I should be glad to hear from them.

Excavations at Abraham's Birthplace

Interesting discoveries have recently been made in Mesopotamia, on the site of Ur of the Chaldees, an ancient city where Abraham was born. For over fifty years excavating has gone on in this place, with numerous interruptions, from one cause or another. Since the War, however, the work has been carried on more regularly and with greater energy. Many wonderful discoveries have been made, including the foundation of a great tower dedicated to the Moon God and built over 4,000 years ago. A more recent temple, built 650 B.C. and dedicated to the wife of the Moon God, was restored by Nebuchadnezzar.

It was underneath the floor of this latter temple that some ancient records of great interest were found. In those days paper and even vellum was not used for writing, which is perhaps fortunate for had it been in use many ancient records could not have remained for us to read. Instead, clay tablets were used and the letters or hieroglyphics marked on them when soft with a stylus or sharp pointed instrument. Then the inscribed tablets were baked, so that they became similar to tiles. By these means the inscriptions on the tablets have been preserved through all the twenty-five centuries that have elapsed since they were inscribed.

A Great Engineer of 4,000 Years Ago

The most important discovery yet made in this region of ancient Babylon, however, is that of five pieces of carved limestone. On being fitted together these form a slab of carved stone about 15 ft. × 5ft. on which are pictures and records of King Ur-Engur, the builder of the great tower to the Moon God. The carvings on the stone show many scenes from the King's life and it is at once evident that King Ur-Engur was a great engineer. Among other exploits he is depicted superintending the digging of great canals to irrigate the ground, and building the great tower already mentioned. From the carvings it appears that the King did this because of a dream, in which the Moon God appeared to him and ordered him to erect the tower. The carved stone shows many other interesting scenes, including files of prisoners, and the soldiers of forty-two centuries ago beating their drums identically as they do to-day!

These discoveries are perhaps even more wonderful than those that have recently been made elsewhere, and which have previously been mentioned in these pages. I hope that the expedition now in Babylon will give us many more interesting items of research into the past, and as the ancient people of Ur were engineers of no mean order we may look forward with particular interest to learning more of their achievements in this direction.

An Index for the "M.M."

For some time past I have felt that the "*M.M.*" had grown to such proportions as to make a paged list of contents useful, if not absolutely necessary. This month, therefore, I am introducing this feature, which will be found at the foot of the third column on page 376. In future, this list of the main contents will appear each month in the same position.

While on this subject I may mention that I am having an index to the year's issue prepared and this, together with a suitable title page, will be ready early in December. This will be good news to those numerous readers who use the special binding case supplied, or who have their "*M.M.'s*" bound at the end of the year.

Result of "Inventors Essay" Contest

The "Inventors Essay" Contest, announced on this page in the March issue, drew an unexpectedly large number of entries, which showed that a good deal of hard work had been done by the entrants. One of the commonest weaknesses shown by competitors, however, was that of failing to grasp the really important things accomplished by each of the great men about whom they had to write. In many cases comparatively unimportant things were put forward prominently in connection with a certain man, whereas the one or two great things, for which he will be remembered for all time, were either passed lightly over or omitted altogether. In some cases, too, competitors showed carelessness in selecting different men from those intended. Thus, while some correctly wrote about Benjamin Franklin, others dealt with Sir John Franklin, although the latter was essentially an Arctic explorer and not an inventor or scientist. Some entrants were more cautious, however, as is illustrated by the fact that although Alexander Graham Bell, the inventor of the telephone, was undoubtedly the most famous of all inventors named Bell, one competitor found no less than three famous men of the name of Bell and wrote at length about each, so as to be on the safe side!

After considering the entries from every point of view, I decided to award the prize of a guinea to C. McCaig, of Willaston. Although this competitor's work was undoubtedly the best submitted, that of two other competitors showed considerable merit and I have therefore decided to award consolation prizes of special pocket wallets to W. E. Andrew (Grove Park, London, S.E.12) and E. H. Billing (Market Harborough).

Our Special Railway Centenary Issue

As mentioned last month a special Centenary Number of the "*M.M.*" will be published in September. Not only will it contain a special article giving a full description of the Centenary celebrations at Darlington, but it will be a special "railway number," in every sense of the word. There will be articles on different types of locomotives, instructions how to make a model railway station, description of the new series of 2-6-4 tank locos recently built for the Metropolitan Railway, an article on the fastest train in Britain, and an article from the pen of the Rt. Hon. J. H. Thomas, M.P., "*Drivers Who Love Their Engines.*" Further particulars will be announced next month.

The number of copies of the special Centenary Number printed will be limited and all readers who have not already done so are advised to place an order at once with their Meccano dealer or newsagent for a copy to be reserved for them.

FAMOUS BRIDGES—No. 3

BROOKLYN BRIDGE

The First Large Suspension Bridge

THE East River, separating New York from Brooklyn, is crossed by three of the greatest suspension bridges in existence—the Brooklyn, Manhattan, and the Williamsburgh Bridges, each of which has a fascinating story from an engineering point of view. Of the three, the Brooklyn Bridge, which is the subject of our cover this month, was the first to be built.

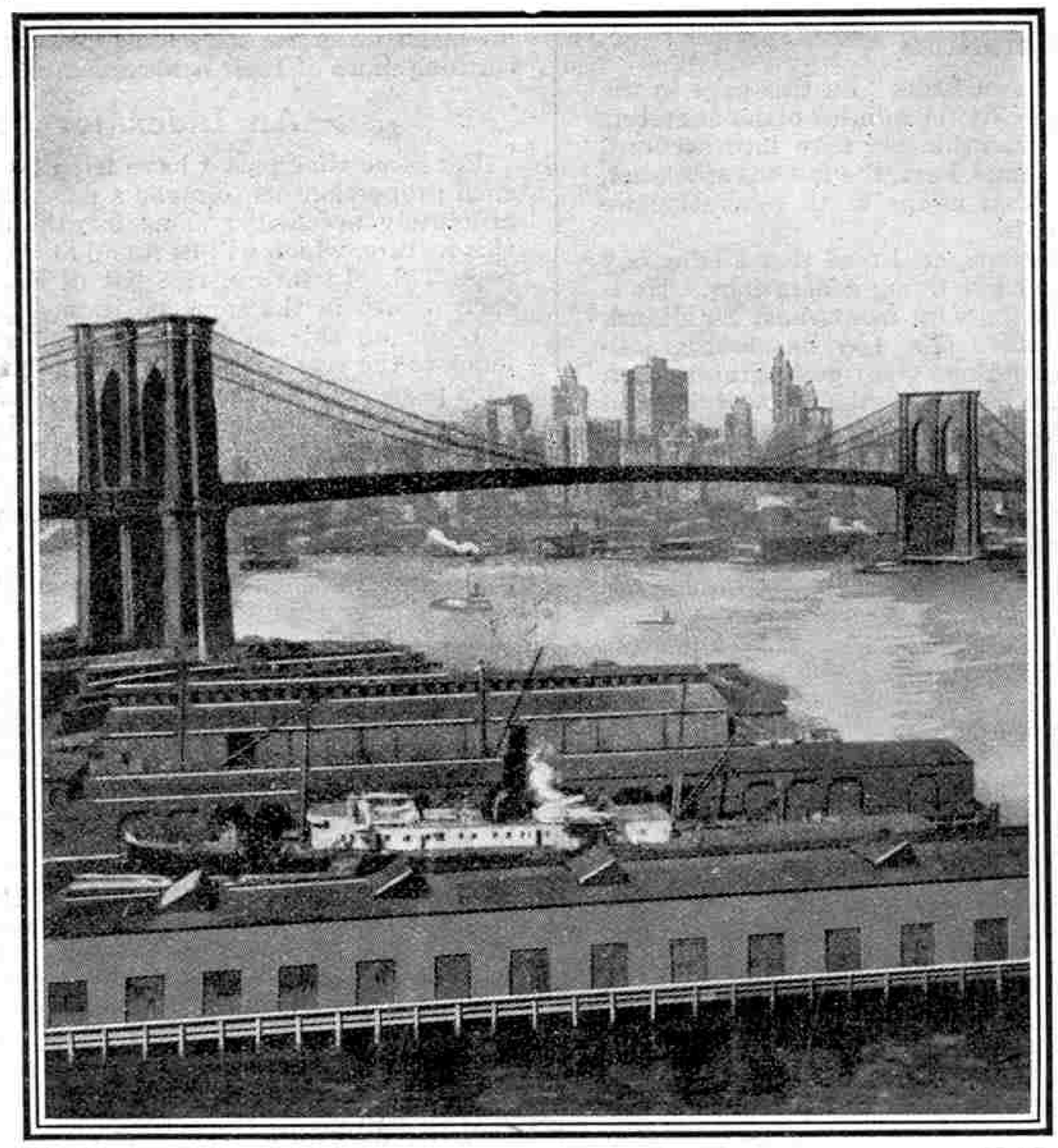
A Pioneer of Wire-rope Making

At the time when the construction of the Brooklyn Bridge was first contemplated, the only means of crossing between New York and the mainland was by ferry boat. In the early eighties, however, the increased traffic between New York and Brooklyn necessitated the introduction of some other means of crossing the river.

Time after time suggestions for various types of bridges had been put forward, but all had been rejected because they were considered impracticable. The East River was both deep and wide and was always so busy with shipping that it was realised that it would be impossible to employ piers on which to rest the girders of any bridge. A single span of so great a width was at that time unheard of, and the construction of a bridge across the East River seemed to be an impossible proposition to put before any engineer.

At last, however, a suspension bridge was suggested by an engineer, who already had considerable experience in this type of structure. The man who launched this daring scheme to bridge the East River was John Augustus Roebling. He was born in 1806 at Mühlhausen in Prussia. He emigrated to the United States in 1831 and ten years later erected a wire-rope works at Pittsburg. He was one of the pioneers of wire-rope making, and to-day the firm he founded is one of the largest wire-rope makers in the world.

He was the first to use the suspension principle in America to support aqueducts for canals. His first suspension bridge, over the River Ohio at Cincinatti, had a length of 1,057 ft. and a height of 103 ft. above the river. It was commenced in 1856 but the American Civil War stopped the work, and the bridge was not opened until 1867. In the meantime Roebling had completed a wire rope bridge across the Niagara Falls, and another at Pittsburg across the Alleghany River.



Photo] [*S.I.B.*

The Brooklyn Bridge across the East River

Roebling's Tragic Death

In his early days Roebling's experience in regard to wire rope bridges was similar to the experience of George Stephenson in regard to railways. Every hand seemed to be against him. His methods and plans were condemned by the leading engineers of the day, who prophesied only failure and disaster for any bridge built on the suspension principle.

Roebling was a stubborn man, however, and he had full confidence in himself and finally his results themselves proved that his idea of making great bridges with wire was not only possible but also that it was by no means a complicated or difficult matter. Then, and then only, the theory that he had striven so hard to maintain was endorsed by boards of noted engineers and acclaimed by the public. He had had to fight his battles single handed, but in the end his confidence in himself was justified and he came out of the ordeal "on top."

Roebling's death was a terrible tragedy, all the more so for it came just as he had reached the summit of his fame. It occurred in 1869, while the great engineer was inspecting the site for one of the towers. The docking of his boat was bungled by the crew with the result that one of Roebling's feet was crushed between the quayside and the boat, and although the accident was comparatively slight, complications arose that proved fatal.

Roebling did not live to see the wonderful structure his imagination had created, but it has been truly said that his name is woven into the very steel of the cables.

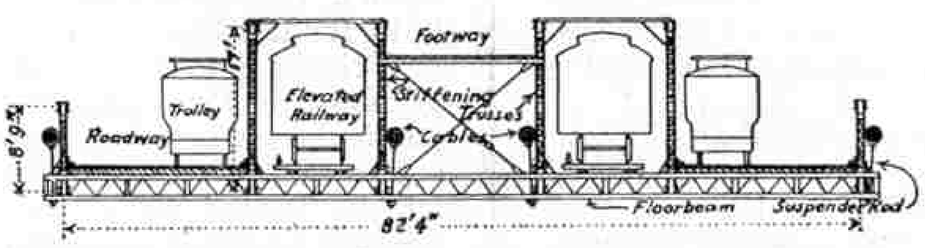


Fig 1. Cross-section of Brooklyn Bridge showing the two roadways, elevated footway, two electric car tracks and two elevated railways

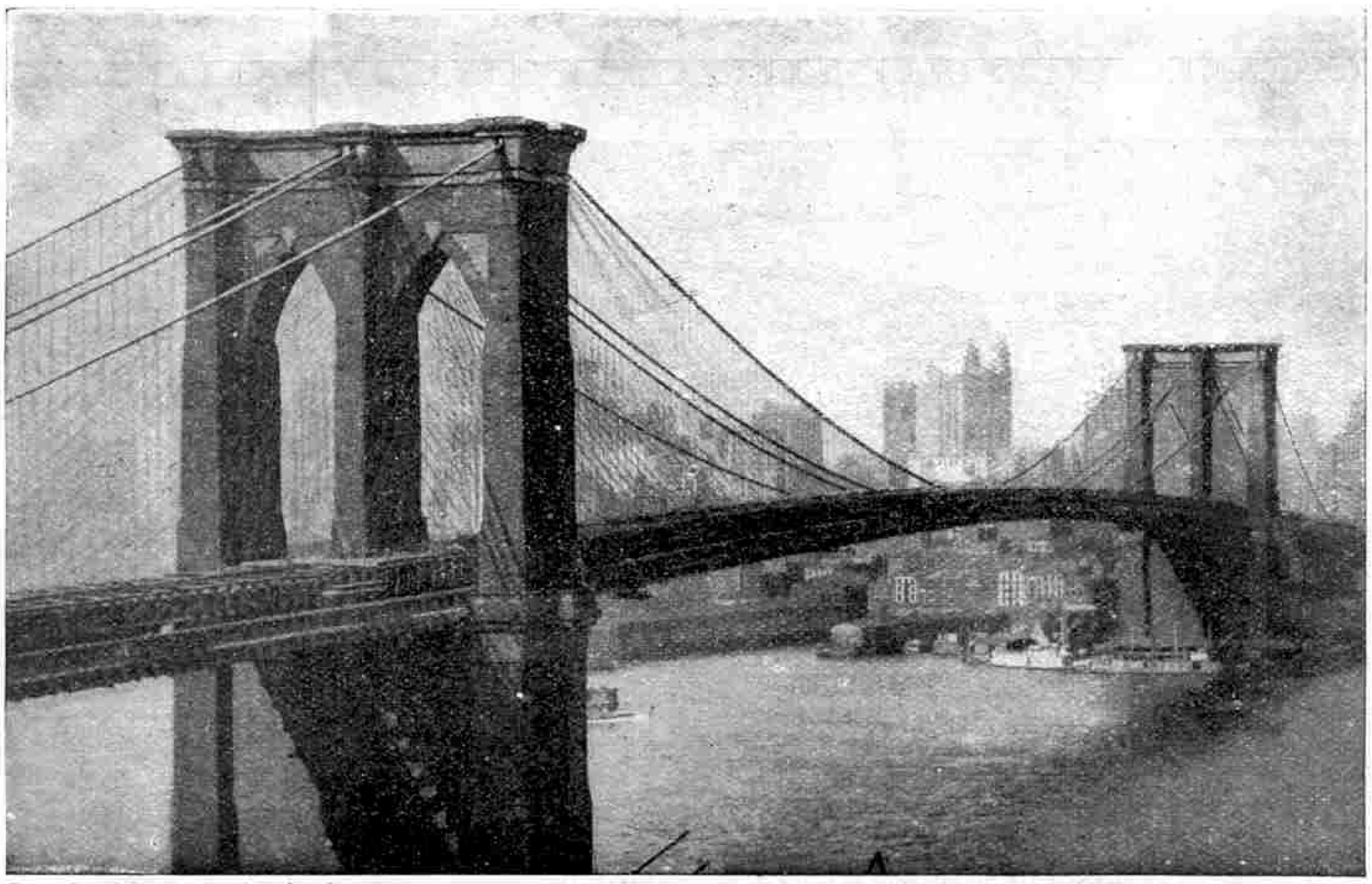
His Son Continues the Work

It was a great triumph for Roebling when his plans for the Brooklyn Bridge were accepted in 1867. In May of the same year he was appointed engineer and authorised to proceed with the work. Although he died whilst the bridge was under construction, the work was not allowed to stop, for his son, Washington Augustus, determined to carry out his father's plans.

The actual work did not commence until 1870, but from that time onward until the bridge was completed there was no rest. Washington Roebling lived on the bridge, and under his supervision the massive masonry towers were gradually erected. Old buildings,

landmarks of ancient New York, were pulled down and the ground cleared for the approaches. Over six years was required for the construction of the approaches and masonry piers and when at last the towers were completed, there remained the gap across the river to be spanned.

This was accomplished by a boat taking a ¾ in. wire rope from the Brooklyn side to the New York shore, where it was passed over the tower and allowed to drop to the level of the river. Then, at a moment when the channel was free from shipping, the free end was carried across and drawn tight. A second rope was similarly suspended and having been joined to the first, was run over huge pulleys at either end, so that the two together formed an endless belt. To this was fixed a travelling platform, which was moved from one side of the river to the other by steam power.



Reproduced by permission from ["*Engineering for our Boys*"

The Suspension Bridge, from the Brooklyn Shore, with New York "Sky-Scrapers" in the distance

Contraction and Expansion

These travelling ropes having been fixed, the spinning of the great cables commenced. The wire in each skein of these cables is nearly 200 miles in length and it is not surprising to find that seven years were required to complete the spinning of the cables.

One of the greatest difficulties encountered in this work was the contraction and expansion of the wires, caused by the variation in temperature of the atmosphere. It was very necessary that the wires should all be secured in uniform weather, for every degree of difference in the temperature caused a corresponding deflection in the slack of the cables of ⅛ inch.

At last, however, the great cables were in position and then the roadway itself was built. In 1883, the great day came when the President and the Governor and many other officials attended the opening ceremony, and the work, commenced 13 years before, had its realisation in this, the greatest bridge of its time.

Dimensions of the Bridge

The Bridge has a total length of 5,989 ft. or rather over a mile and a furlong. The central span between the two towers over which the suspension cables hang, is 1,959 ft. in length. The two shore spans from the towers to the anchorages are 930 ft. in length and the approach viaduct on the New York side is 1,562½ ft. in length and on the Brooklyn side 971 ft.

The suspension towers, which are massively built of masonry and stand on two piers built on the solid rock, rise to a height of 272 ft. They extend for 78 ft. below high water level so that they measure 350 ft. from the foundation to the top.

There is a clear headway of 135 ft. between the centre of the bridge and the river, and of 118 ft. near the piers at high water, so that vessels can freely pass beneath.

Details of the Suspension Cables

The four cables each contain 5,296 galvanised steel wires, placed side by side and untwisted. The cables were formed in this manner in preference to the usual method of twisting the wires together, as unbent and untwisted wire has a greater resistance than wire that is twisted. The wires are laid as close together as possible and arranged in nineteen strands, each of which is bound up with thick wire. Each cable has a diameter of 15¾ in. and a breaking strain of 12,000 tons.

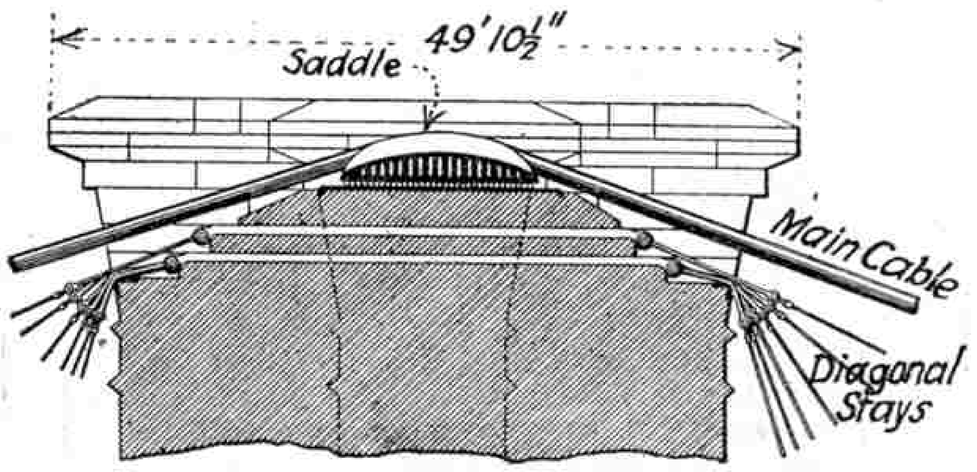


Fig. 2. Section of the top of one of the towers, showing saddle over which the main cable passes*

(*Figs. 1 and 2 are reproduced, by permission of the publishers, from the Editor's book "Engineering for Boys")

The cables have a dip of 128 ft. in the centre of the large span and they rest on moveable saddles at the top of the towers (see Fig. 2). These saddles allow for slight movements of expansion and contraction in the cables, due to changes of temperature and alterations in load.

The cables are anchored at each end by massive masonry built on the shore, and supplementary cables, extending fan-like on each side of the towers, assist in supporting the shore spans and the portion of the long span roadway nearest the towers. They also brace the roadway and reduce its deflection under heavy loads.

The Seven Divisions

The roadway of the Bridge is 82 ft. 4 in. in width and is separated into seven divisions. The centre track forms a footway and is 15½ ft. in width and is raised 12 ft. above the level of the bridge. On each side of the footway are the rails of an elevated railway and on each side of these tracks are roadways 19 ft. in width, each of which has a trolley car track and a road for vehicles.

The Bridge thus carries two roadways, two trolley-car tracks, two railway tracks, and an elevated footway.

Opened in 1883, the Bridge remained by far the largest span in the world for seven years. It was deprived of its proud position in 1890 by the Forth Bridge, two spans of which exceed the large span of the Brooklyn bridge by 115ft.

The Brooklyn Bridge, as is the case with most suspension bridges, is a graceful structure. It cost about £3,100,000 or about three times the original estimate.

Effects of Modern Traffic

When the bridge was built it was not expected that it would be required to carry the heavy railway rolling stock and electric cars of to-day, and consequently it was not constructed to withstand so great a strain of modern traffic.

Thus it is not surprising that in 1901 several of the short rods suspending the trusses from the cables were found to have snapped. It was then decided that the bridge needed strengthening in all its details.

This work was successfully carried out and the bridge to-day is as strong as ever and likely to remain in use for many years, if no accident occurs to it.

SWISS, FRENCH AND ENGLISH RAILWAYS COMPARED

By H. E. Underwood

Photo] [*Swiss Federal Railways*

Northern Entrance to the St. Gothard Tunnel, at Göschenen

AS is the case with the inhabitants, the railways of the various countries of the world all have certain distinguishing features, and it is always interesting to compare foreign locomotives, rolling-stock and methods of working with those of our own railways. The following article deals with the more interesting and important points of difference between British railways and those of France and Switzerland.

Railway Organisation

First of all, there is the difference in the organisation of the respective railways. In Great Britain and France the lines are owned by various private companies, but in Switzerland the railways for the most part are owned by the State. For this reason they are called the Swiss Federal Railways, which name includes practically all the main lines and a large number of the branch lines also. On the other hand, the Swiss mountain lines—"funiculars" as some of them are called—are owned by various companies, and they form an interesting class quite apart from the ordinary railways. Mountain railways were briefly described in last month's "*M.M.*" and we have another article in preparation.

In France there are six railway systems—Nord, from Paris to Calais and Belgium; Est, Paris to Germany and Basel; P.L.M. (Paris—Lyons—Méditerranée), Paris to Lyons, Marseilles, the Riviera, Italy and Switzerland; Paris—Orleans, Paris to Bordeaux and Nantes; Etat, Paris to Bordeaux, Brest and Dieppe; and Midi, lines at the foot of the Pyrenees, centred round Bordeaux and Toulouse.

Of these lines only one, the Etat, is owned by the State, and all of them except the Midi have one or more terminal stations in Paris. (Incidentally it may be mentioned that the locos and rolling-stock of the Hornby Trains in France are lettered to correspond with either the P.L.M., Nord or Etat lines).

The Track

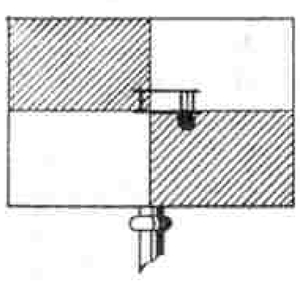
Turning now to the technical and mechanical differences between the railways of the three countries, we will deal first with the track itself.

In England and on the Etat, Orleans, and Midi railways of France, double-headed rails are fitted in chairs and held in position by wooden blocks. In all other countries a rail of Vignole type is secured to the sleeper by means of a spike driven on each side, bolts being used instead of spikes in the case of metal sleepers.

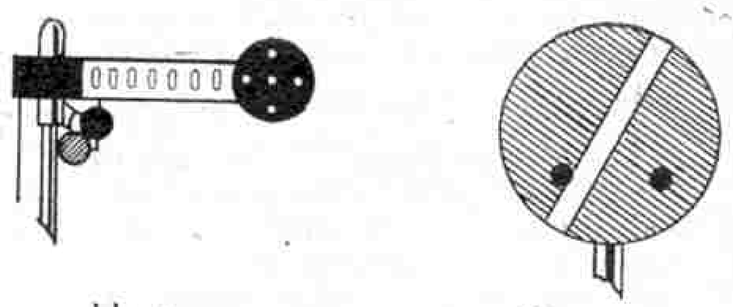
The main lines generally have two tracks in France and in Switzerland, although this is less frequently the case in the latter. Local lines in both countries are always single-track. Four-track lines, which are so common on main lines in England, do not exist in Switzerland. In France they are to be found only on a few main lines for a short distance out of Paris. The standard gauge of the Swiss and French Railways is 1.435 metres, slightly over 4 ft. 9 in., as compared with the British gauge of 4 ft. 8½ ins.

Stations

Stations in France and Switzerland differ in many respects from those in



French Signals



Swiss Signals

England, the most noticeable difference being in regard to the platform. In France and Switzerland, and in fact in nearly every country in the world except England, the platform consists of a simple pavement raised only a few inches above the level of the track. Such a thing as stepping directly from the platform into the carriage is a luxury known only in this country and on certain electrified lines in the United States. In nearly all other countries boarding a train or leaving it is a matter of climbing up or down, as the case may be!

Another point to be noted is that all Swiss stations are "open"—that is to say, entrance is free, the tickets being examined in the trains. In England and France, and in many other countries also, the stations are closed and tickets are punched or collected at the station entrance or exit. In such a case, entrance to the stations is confined to passengers, the booking hall being situated outside the control gate. In many cases, as in this country, friends seeing passengers off, or meeting trains, are allowed on the platform on production of a "platform ticket," which is obtainable for a small sum (one penny in this country) either at the booking office or from an automatic machine near the station entrance.

Swiss stations are generally built to conform to the style of their surroundings. In the mountain districts they are mostly designed on the lines of the neighbouring "chalets." In the cities, however, they are planned on lines in keeping with the other public buildings, and compare favourably in architectural beauty with the stations of any other country. The stations of Lausanne, Bienne, Basel, Lucerne, and Thoune are specially fine buildings.

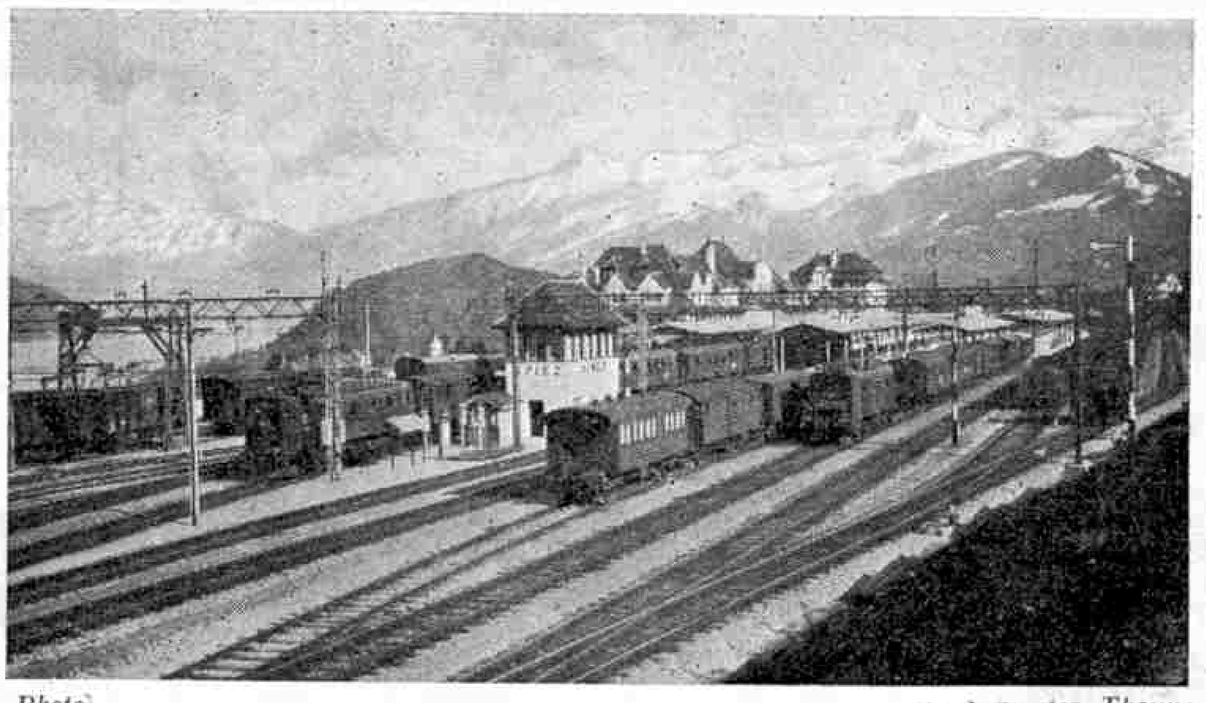
In France the station buildings, with the exception of those in and around Paris, are as a rule unsatisfactory and frequently not too clean.

Signalling Methods

The signalling methods adopted on the various railways are as interesting as they are important.

In Switzerland the system does not differ a great deal from that in use in England. The "home" signals are of the semaphore type, but for "distant" signals green discs are used, which face the track to indicate "danger" and are turned face upward for "line clear." At night two green lights are shown for "danger" and two white lights for "line clear." The "home" signals show one red or one green light respectively for danger or safety. There are also specially-shaped signals, coloured blue, for controlling shunting movements.

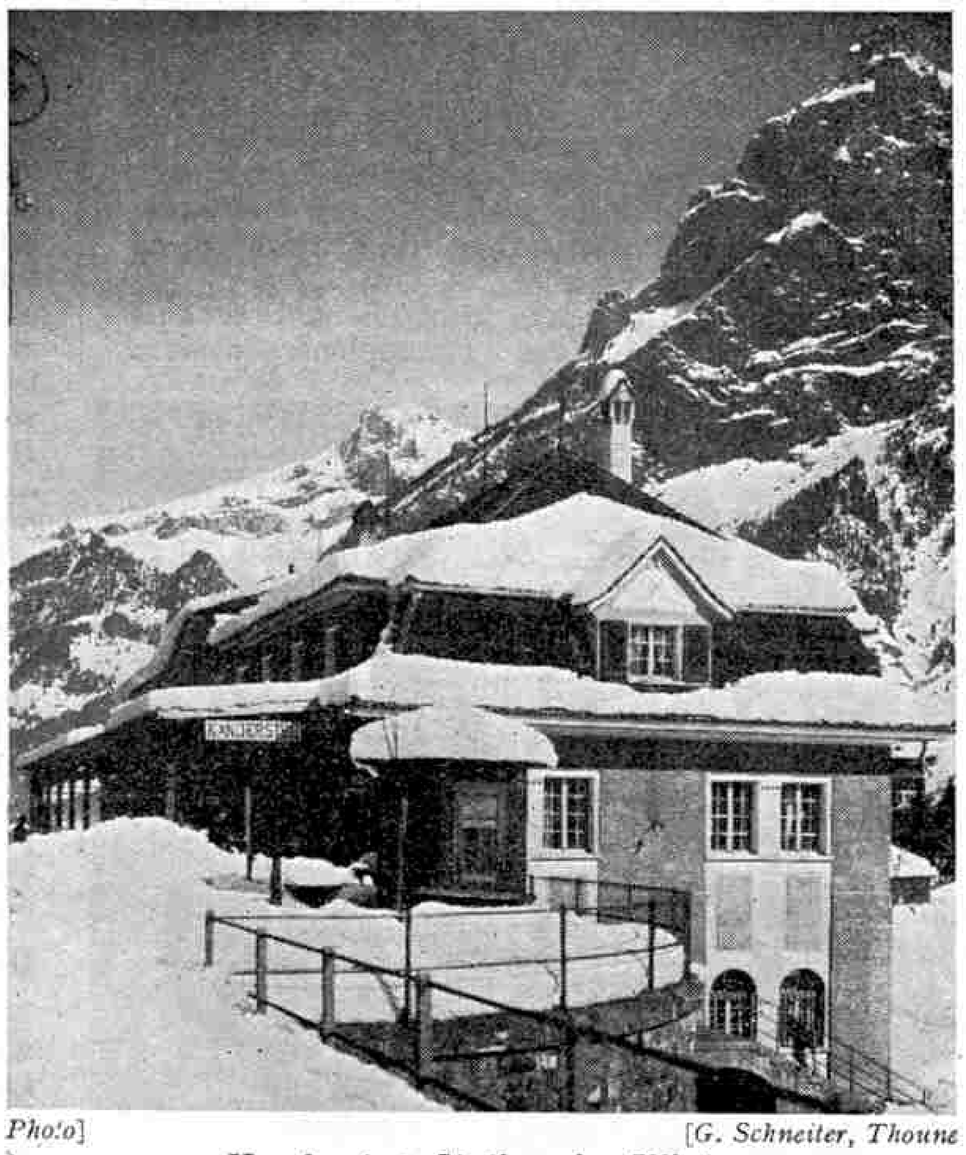
French signalling is more complicated, but judging from the number of accidents on French railways it does not appear to be any more satisfactory than the English or Swiss systems. On French lines a distinction is made between signals for block-sectioning and those for what is called "station protection." The first class of signals take the form of semaphores rather similar to English "home" signals. These are used only between stations for block-sections. The other signals are placed at all points requiring special protection—junctions, stations, etc.—and they are used also as "starting" signals. They are known as "*carrés*," the name being derived from their peculiar form, which is that of a flat square plate divided into four equal parts, which are coloured alternately red and white. The "distant" signal is a disc as in Switzerland, but the French signal indicates "line clear" when the face is parallel to the track. There are, of course, other types of signals in France, mostly discs coloured green, blue or yellow, but those just described are the most important.



Photo] [*G. Schneiter, Thoune*

Spiez Station, an important Junction

An electric locomotive of the Lötschberg Railway is seen on the left, near the signal box, and a signal, seen from the back, to the right.



Photo] [*G. Schneiter, Thoune*

Kandersteg Station in Winter

Tunnels and Bridges

As is only to be expected in a mountainous country, tunnels and bridges occur very frequently on Swiss lines, and are often on a larger scale than those of England or France. The most noted are the three great Alpine tunnels—the Simplon (12¼ miles in length), the St. Gothard (9¼ miles) and the Loetschberg (9 miles). Other tunnels over five miles in length are the Ricken tunnel between Wattwil and Uznach (near the Lake of Zurich), the Moutier-Granges tunnel on the Bienne-Basel line, and the Hauenstein lower tunnel between Olten and Basel.

The St. Gothard Tunnel

The construction of the St. Gothard Tunnel was commenced in September 1872, driving proceeding from each end. Progress was made at the rate of 304 yards per month at each end when using rock drills. The chief difficulty in boring occurred where a variation in the condition of the strata to be traversed caused the drill to diverge sideways to softer rock and thus jam itself in the hole. The headings were joined on 29th February 1880, seven years and five months from the commencement of work. To show how greatly the adoption of improved machinery had speeded up the work it may be mentioned that the average daily advance of the two headings was six yards as compared with 2½ yards at the Mont Cenis Tunnel, to which reference will be made later. A considerable amount of water was encountered, whereas scarcely any water at all was met with in the Mont Cenis Tunnel.

The St. Gothard Tunnel was found to be 8⅓ yards shorter than had been calculated. The centre lines of the northern and southern sections of the tunnel, although prolonged for more than four miles from each extremity, differed in direction only by 13 in. at their junction, while the error in level was

(*Continued on page* 348)

Photo] [*Swiss Federal Railways*

St. Gall Station

Lives of Famous Engineers

XVIII
Isambard K. Brunel's
CLOSING YEARS

IN our account of the famous "Battle of the Gauges" we showed how Brunel's views were directly opposed to those of the two Stephensons. A similar state of affairs existed also in a remarkable railway project with which Brunel became associated and which proved to be an utter failure. This scheme was for the working of the South Devon Railway on the "Atmospheric System."

The idea of producing motion by means of atmospheric pressure is said to have originated with Papin, the French philosopher, more than two centuries ago. Little was done in the matter until 1810, however, when a Mr. Medhurst published a pamphlet with the object of proving the possibility of carrying goods and letters by this means. About fourteen years later a Mr. Vallence, of Brighton, took out a patent for a method of projecting passengers in special carriages through a large tube exhausted of its air, and in 1835 an American named Pinkus took up the same idea.

The scheme attracted a good deal of public attention and an association was formed—largely through the efforts of Dr. Lardner and Mr. Samuel Clegg—to carry it into effect. The sum of £18,000 was raised and a model apparatus was constructed and exhibited in London,

In 1840 Mr. Clegg and a Mr. Samuda patented a complete plan for an atmospheric system and tested its working on an unfinished section of the West London Railway. This experiment met with so much success that the directors of the Dublin and Kingstown Railway adopted the system for the line between Kingstown and Dalkey, and it was also adopted by the London and Croydon Railway.

The method employed on these railways was as follows. A cast iron tube, 15 in. in diameter, was laid down between the two rails of the track. At intervals of about three miles along the line were erected stationary engines driving powerful air pumps, by means of which air could be exhausted from the tube, thus creating a partial vacuum. Inside the tube at one end was placed a closely fitting piston connected to the carriages, and when the air was exhausted from the tube the pressure of the outer air forced this piston along the tube towards the air pumps, drawing the carriages with it.

Brunel Recommends Atmospheric System

About 1843 the directors of the Chester and Holyhead Railway requested Robert Stephenson to report on the advisability of adopting the atmospheric system on that line. Stephenson based his report on experiments carried out on the Dalkey line. He stated that he was strongly averse to the adoption of the method on the grounds that, although it was capable of being developed into a practical working system, yet atmospheric traction must be much more costly than locomotive traction on lines with ordinary gradients, and more costly than rope traction on steep gradients.

About the same time Brunel became interested in the atmospheric system and after careful consideration he arrived at a directly opposite conclusion from that of Robert Stephenson. Brunel regarded the Dalkey experiment as being entirely satisfactory, and argued that a system of machinery which, even at the first attempt, had worked without interruption and constantly for many months, must be considered practically to be free from any mechanical objection.

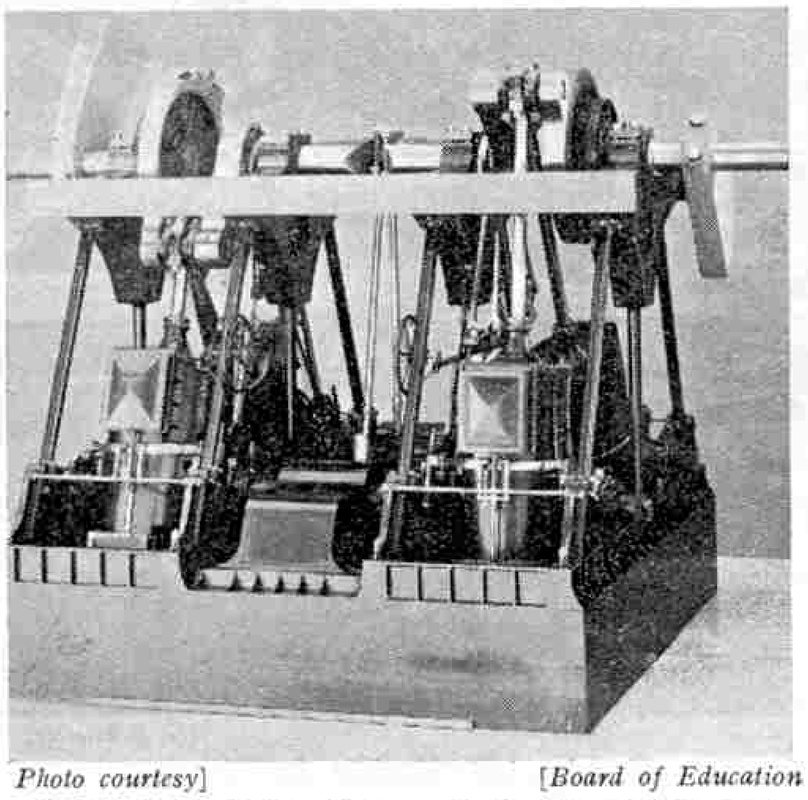


Photo courtesy [*Board of Education*

Model of the Paddle Engines of the "Great Eastern"

In 1844 Brunel recommended the directors of the South Devon Railway to adopt the atmospheric system. The chief characteristic of this railway was that, while it traversed very heavy country, its principal changes of level were concentrated in four long and steep inclines. These inclines were intended to be operated by auxiliary power, and Brunel thought that the atmospheric system was the most suitable for this purpose. The directors of the railway resolved to act on Brunel's advice and work was commenced.

A Costly Failure

After many delays due to various causes a section of the line was completed and passenger trains commenced to run daily. To some extent the anticipated results were realised. The motion of the trains was smooth and agreeable and in one instance a speed of 68 miles an hour was recorded for a train of 28 tons. Serious difficulties quickly began to develop, however, and it was found that the cost of traction was nearly nine times as much as had been calculated, and was between two-and-a-half and three times what it would have been with locomotive traction. Brunel did his utmost to make the railway a success but without avail, and ultimately, on his recommendation, the directors abandoned the system.

The costly failure of the atmospheric system fully justified George Stephenson's prediction made after he had examined the model apparatus exhibited in London. "It won't do," he declared emphatically. "It is only the fixed engines and ropes over again in another form, and to tell you the truth I don't think this rope of wind will answer so well as the rope of wire did."

Dock and Pier Works

In addition to his work in connection with railways and steamships, Brunel found time to carry out various dock and pier schemes. His first important work of this kind was at Monkwearmouth, at the mouth of the river Wear opposite to Sunderland. For many years the question of making suitable docks to cope with the growing traffic had been under consideration and various designs had been proposed by different engineers, but no practical steps were taken.

In 1831 designs for suitable docks were submitted simultaneously by Brunel and another engineer. Brunel's docks were to have been on the north side of the river with an area of 25 acres. Neither of these designs was approved by Parliament, but soon afterwards a private company was formed with the object of constructing a dock on a plan designed by Brunel, but on a very much smaller scale than his original scheme, the area of this dock being only about six acres with a tidal basin of about one-and-a-half acres.

The town of Sunderland opposed the proposals of the company, but the latter succeeded in obtaining a royal charter for the construction of the dock, and subsequently an Act of Parliament giving them

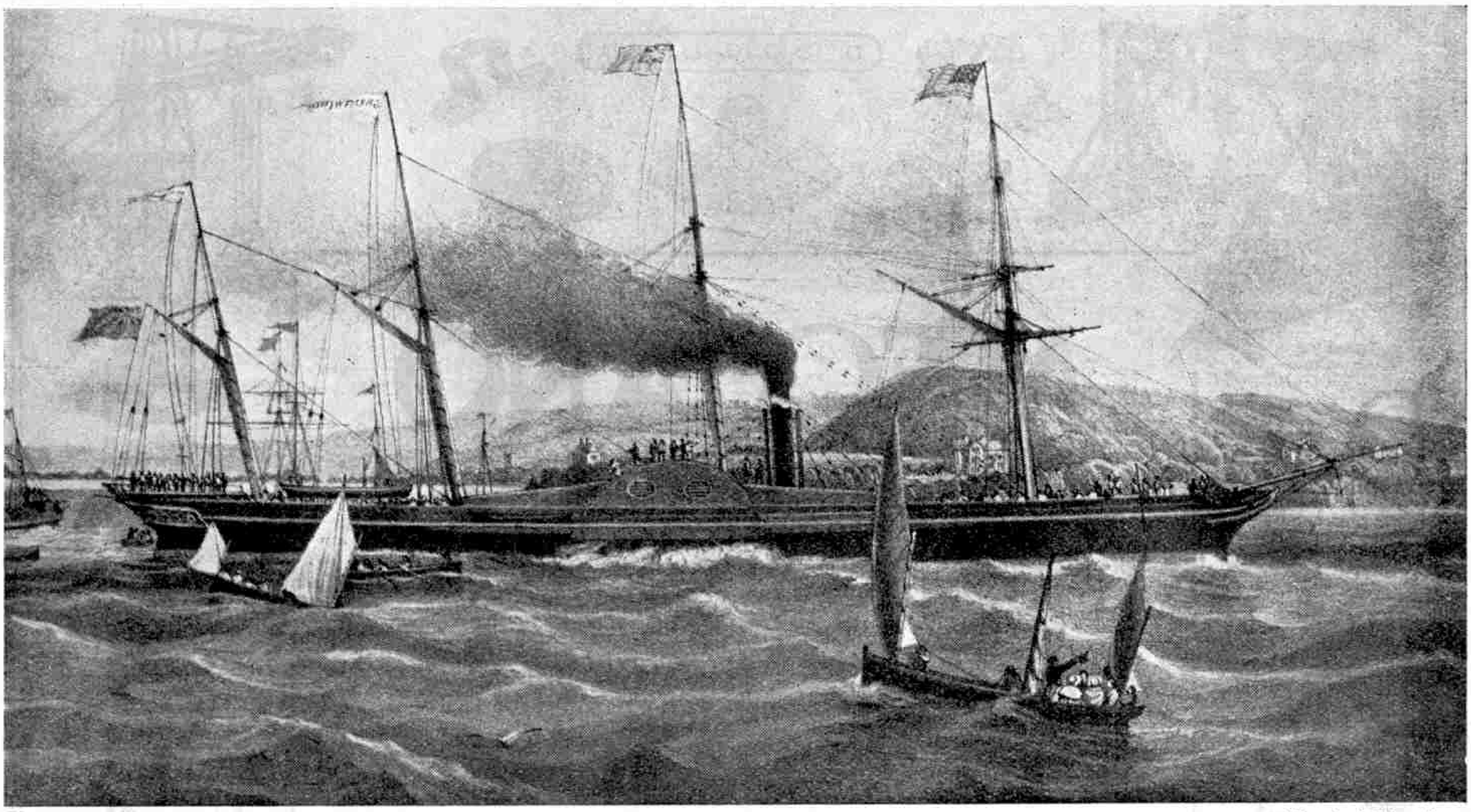


Photo courtesy] [*Board of Education*

The "Great Western"

power to make the entrance from the dock to the river. The dock was duly constructed and eventually became the property of the North Eastern Railway. An interesting feature about this dock is that the gates were built of timber, this being the only occasion on which Brunel did not use wrought iron.

Improvements at Bristol

In 1804 the portion of the river Avon flowing through the city of Bristol was enclosed, the water in it being thus retained at a constant level. This portion of the river, called the Floating Harbour or Float, was about two miles long and 100 yards broad. At its lower end it was connected to the river by a half-tide basin, called the Cumberland Basin, with two locks. As time went on, mud accumulated to such an extent in the Floating Harbour that the position became serious, and in 1832 the directors of the dock company consulted Brunel on the matter. He recommended various measures, some of which were acted upon, and some improvement was effected. One of his proposals for this purpose was to increase the amount of water passing through the Floating Harbour so as to prevent deposits settling.

Brunel also enlarged one of the locks between the Cumberland Basin and the river in order to permit of the passage of large vessels. The necessity for this had become strikingly evident when Brunel's ship the "*Great Britain*" was built, for in order to enable the ship to pass from the basin to the river a portion of the lock masonry had to be removed. The chief point of interest in Brunel's new lock lay in the fact that it was the first in which wrought iron gates were introduced, these gates being rendered buoyant by large air chambers formed in their lower portions.

Brunel was afterwards engaged on extensive dock and harbour work at Plymouth, Briton Ferry near the mouth of the river Neath, and at Brentford on the Thames. He also gave a great deal of attention to the improvement of large guns and he designed a floating gun-carriage for the attack on Cronstadt in the Russian War of 1854. In the following year he designed and superintended the construction of hospital buildings at Renkioi on the Dardanelles.

Brunel's Career

Brunel's career affords a remarkable example of a combination of genius, energy and industry. When he was appointed engineer to a company he at once assumed the position of sole adviser to the company in everything relating to the construction and mechanical working of the undertaking concerned. He would not allow any one to be associated with him in the supreme control, and immediately he felt that the directors were losing any of their confidence in him he took immediate steps to resign his post at whatever sacrifice. On the other hand, so long as he felt that he had the whole-hearted support of the directors he devoted himself absolutely to their interests, never allowing considerations of convenience or even health to interfere with any work he felt would be to the benefit of the company. He was accustomed to place entire confidence in his assistants as long as he felt that they were carrying out their work in the proper manner, and he was always ready to shield his subordinates from interference by others. When anything did go wrong he was always eager to give the offender another chance.

General character

A good estimate of Brunel's general character may be obtained from the following extracts from a letter of one of his personal friends :—

"No one, I believe, ever saw him out of temper or heard him utter an ill-natured word. He often said that spite and ill-nature were the most expensive luxuries in life ; and his advice, then often sought, was given with that clearness and decision, and that absence of all prejudice, which characterised his opinions in after-life. All his friends of his own age were attached to him in no ordinary degree, and they watched every step in his career with pride and interest. In fact, he was a joyous, open-hearted, considerate friend, willing to contribute to the pleasure and enjoyment of those about him.

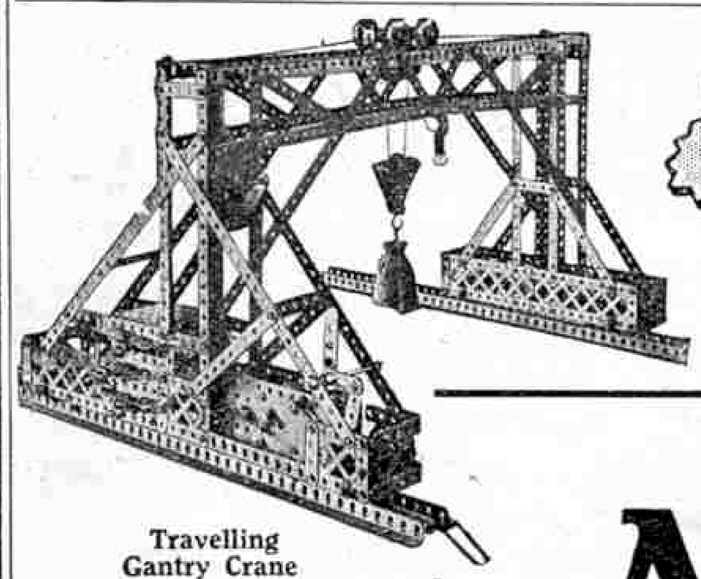
"His professional friends . . . . and his private friends at all times well knew the genius, the intense energy, and indefatigable industry with which every principle and detail of his profession was mastered ; and both knew and valued the high moral tone which pervaded every act of his life."

Although Brunel was in the forefront of almost all the great engineering controversies and contests of his time, he always maintained friendly relations with his fellow engineers. On this point the following short extract from one of Brunel's private journals is of interest. These words were written in 1846, at the height of the "Battle of the Gauges," in which Brunel and the Stephensons were opposed : "I am just returned from spending an evening with R. Stephenson. It is very delightful, in the midst of our incessant personal professional contests, carried to the extreme limit of fair opposition, to meet him on a perfectly friendly footing, and discuss engineering points."

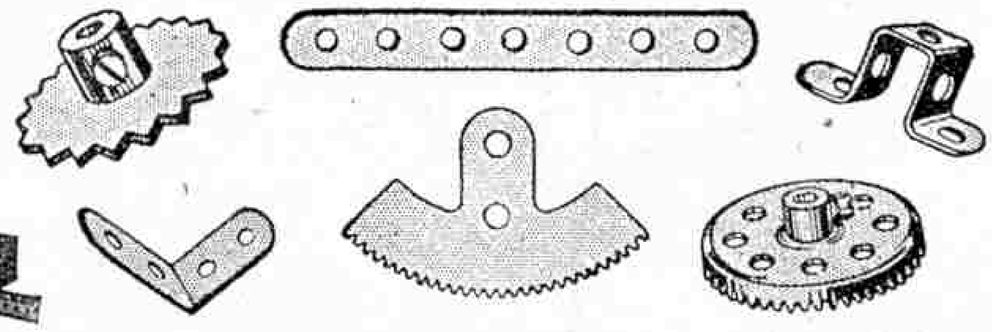
Closing Days

There is no doubt that the gauge controversy and the fierce contest that followed it, together with the failure of the atmospheric system on the South Devon Railway, caused Brunel great anxiety and sorrow. The difficulties that occurred in the launch of the "*Great*

(*Continued on page* 361)

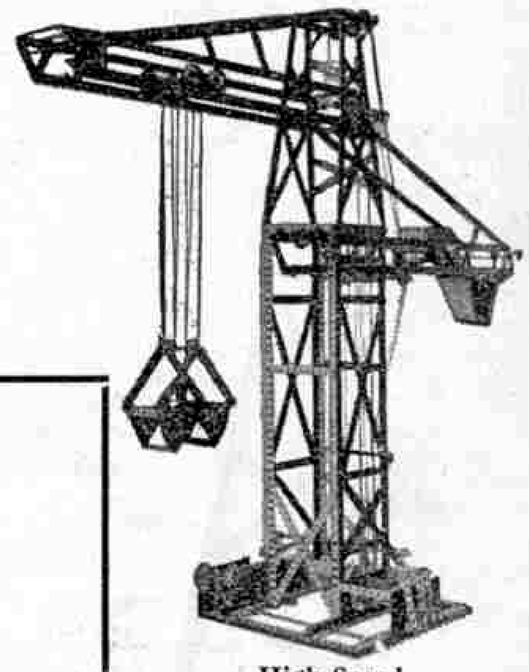


Travelling Gantry Crane



MECCANO

ENGINEERING FOR BOYS



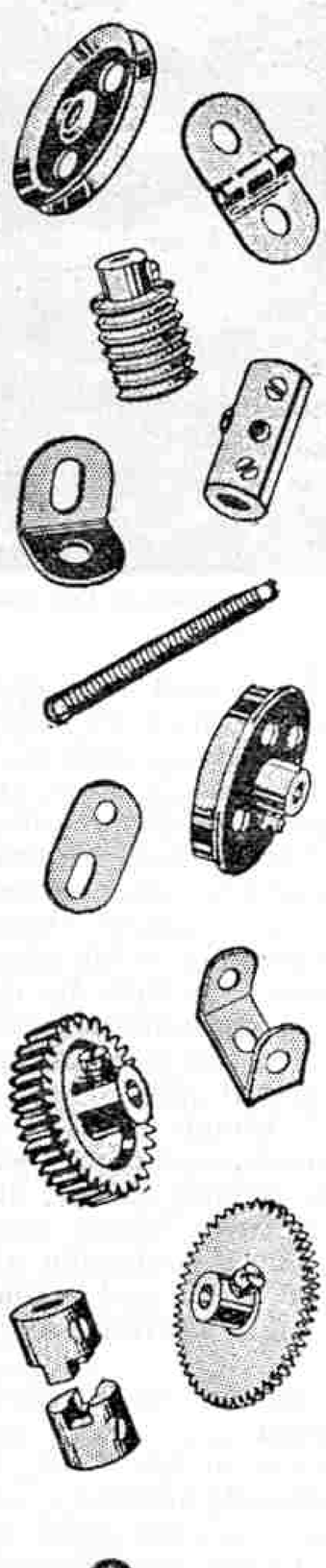
High-Speed Ship-Coaler

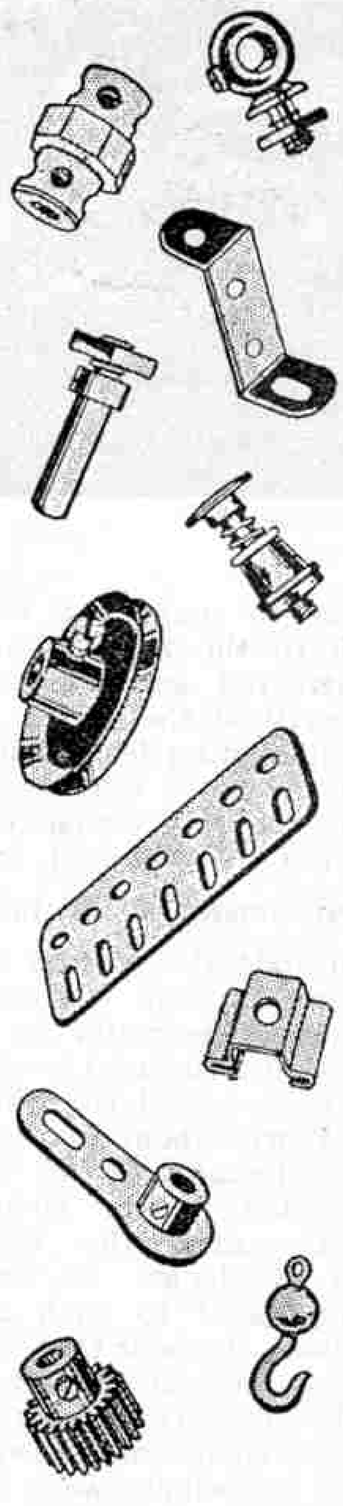
Meccano this year is heaps more fun than it has ever been before. Many new parts have been added recently, and this, of course, means new and better models.

There is no limit to the number of models any boy can build with a Meccano Outfit. The hundreds shown in the Instruction Manuals are just suggestions and no boy ever stops when he has built them—he goes on building new models that he invents himself.

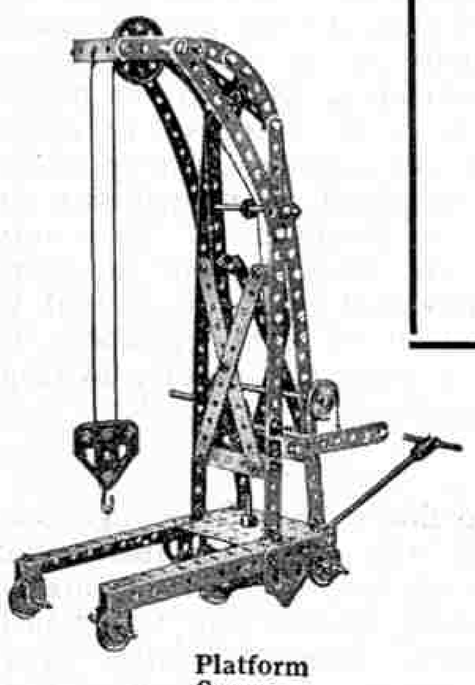
That's why Meccano is such splendid fun. The Crane you build to-day is a Tower to-morrow, a Motor Chassis the next day and so on. You can build a new model every day for years, if you wish! They will be **real** models, too, all sturdy and strong because they are built of steel. Meccano parts are exactly similar to the parts used by real engineers, only smaller. That's why Meccano Cranes lift and swing heavy loads, Meccano clocks keep perfect time, Meccano motor-cars run, and Meccano Looms weave real fabrics.

Meccano models are easy to build—you only require a spanner and screw-driver and these are provided in every Outfit.

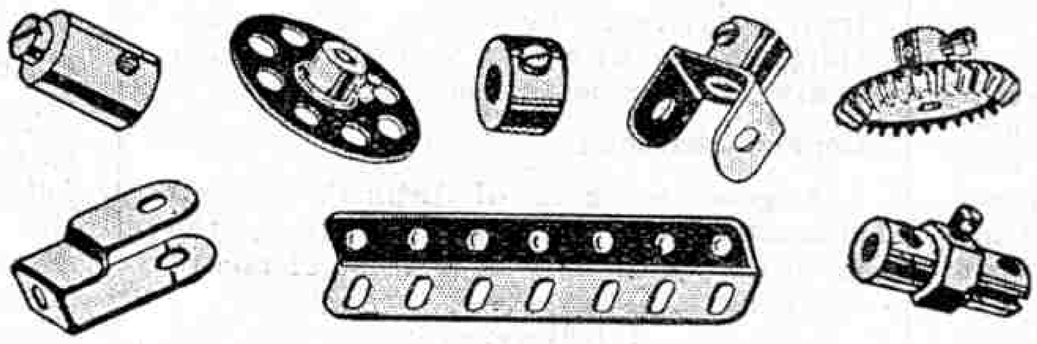


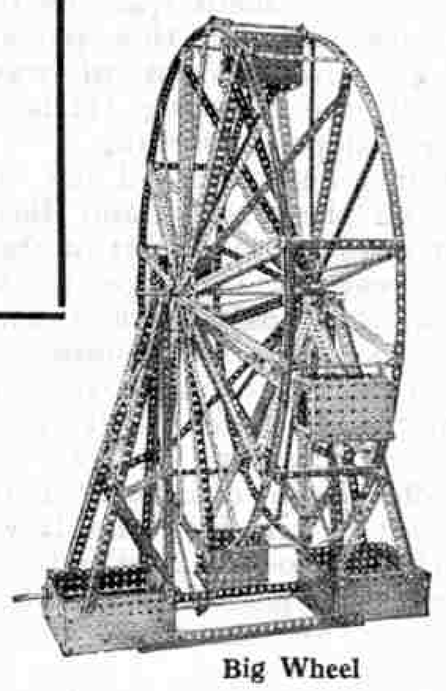


COMPLETE OUTFITS		ACCESSORY OUTFITS	
No. 00	3/6	**No. 00a**	1/6
No. 0	5/–	**No. 0a**	4/–
No. 1	8/6	**No. 1a**	7/6
No. 2	15/–	**No. 2a**	8/6
No. 3	22/6	**No. 3a**	18/6
No. 4	40/–	**No. 4a**	15/–
No. 5 (in well-made carton) ...	55/–	**No. 5a** (in well-made carton) ...	50/–
No. 5 (in superior oak cabinet with lock and key)	85/–	**No. 5a** (in superior oak cabinet with lock and key)	80/–
No. 6 (in well-made carton) ...	105/–	**No. 6a** (in superior oak cabinet with lock and key)	210/–
No. 6 (in superior oak cabinet with lock and key)	140/–	Electrical Outfit	42/–
No. 7 (in superior oak cabinet with lock and key)	370/–		



Platform Crane





Big Wheel

A NEW MECCANO MODEL

Model No. 627. Automatic Weighing Crane

THIS is a model of a crane that, by means of a simple and ingenious contrivance, automatically registers the weight of the load which it is in the act of lifting.

The advantages of such an arrangement in actual practice are many and must be obvious. For example, a great deal of time is saved in loading goods wagons, ships, lorries, etc., where without a weighing crane much of the goods would have to be weighed on a separate machine, consequently incurring additional labour and increased expense in handling. Again, the crane operator can tell at any time from a glance at the load indicator, the extent of the stress to which the crane is being submitted and is thus able to keep within a certain safe margin of the capacity limit of the crane.

Constructing the Model

This is a simple and very interesting model to build, and our illustration shows very clearly most of the constructional details. The pedestal upon which it is mounted runs upon rails built up from Angle Girders, which, of course, may be extended to any desired length.

The wheel base consists of four Flanged Wheels (24), mounted in bearings (23) formed from $2\frac{1}{2}$" Strips connected to the girders (20) by Angle Brackets. One of these Flanged Wheels is connected by gears to a hand-wheel (Fig. C), the operation of which imparts the traversing movement to the model along the rails. The upright columns (21) are connected at the top by $5\frac{1}{2}$" Girders, and at the wheel base, where they are slightly splayed-out, by $9\frac{1}{2}$" Girders. The construction of the strengthening struts is clearly shown.

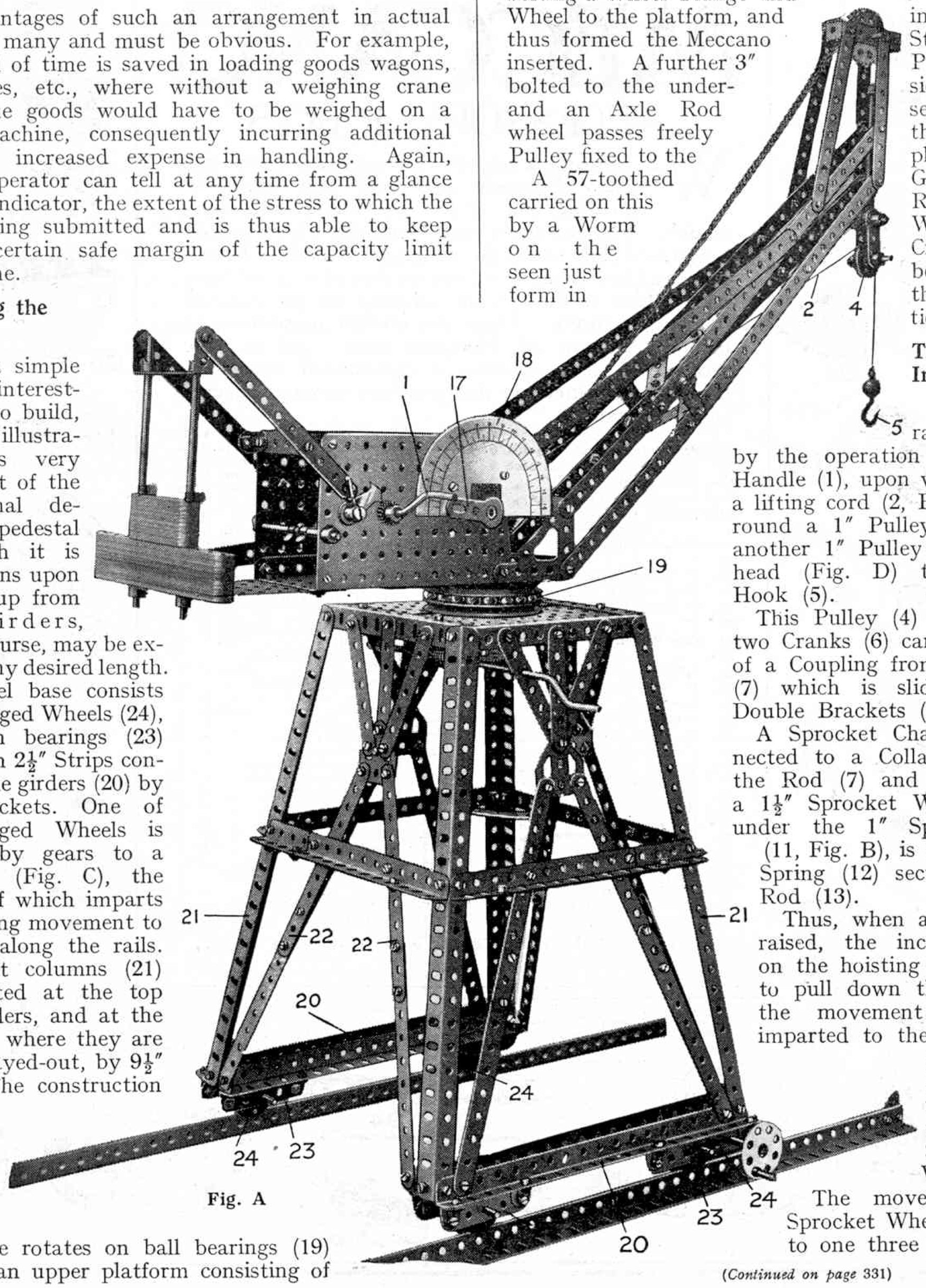


Fig. A

The crane rotates on ball bearings (19) carried on an upper platform consisting of two $5\frac{1}{2}$" Flanged Plates, bolted between the upper $5\frac{1}{2}$" Angle Girders.

The lower fixed race of the ball bearings is formed by bolting a Wheel Flange and 3" Pulley Wheel to the platform, and in the channel thus formed the Meccano Steel Balls are inserted. A further 3" Pulley Wheel is bolted to the under-side of the crane, and an Axle Rod secured in this wheel passes freely through the 3" Pulley fixed to the platform.

A 57-toothed Gear Wheel carried on this Rod is engaged by a Worm Wheel mounted on the Crank Handle seen just below the platform in the large illustration.

The Load Indicator

The load is raised or lowered by the operation of the Crank Handle (1), upon which is wound a lifting cord (2, Fig. B), passing round a 1" Pulley (3) and over another 1" Pulley (4) at the jib head (Fig. D) to the loaded Hook (5).

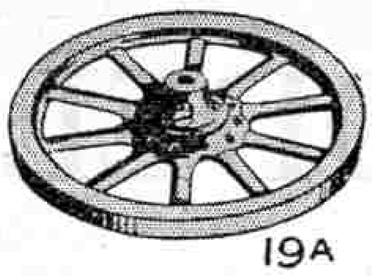
This Pulley (4) is mounted in two Cranks (6) carried by means of a Coupling from the $3\frac{1}{2}$" Rod (7) which is slideable in two Double Brackets (8).

A Sprocket Chain (9) is connected to a Collar mounted on the Rod (7) and passing round a $1\frac{1}{2}$" Sprocket Wheel (10) and under the 1" Sprocket Wheel (11, Fig. B), is connected to a Spring (12) secured to a $3\frac{1}{2}$" Rod (13).

Thus, when a load is being raised, the increased tension on the hoisting cord (2) tends to pull down the Pulley (4); the movement consequently imparted to the Chain (9) extends the Spring (12) and in doing so rotates the Sprocket Wheel (11).

The movement of this Sprocket Wheel is magnified to one three times as great

(*Continued on page* 331)


19A

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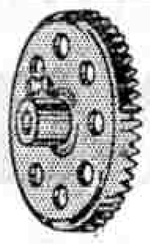
9B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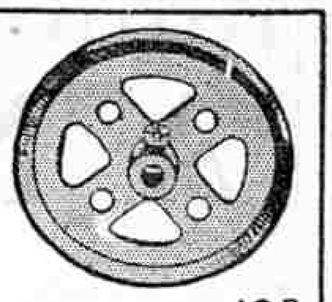
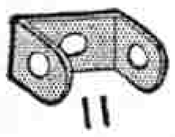

19B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10

22A

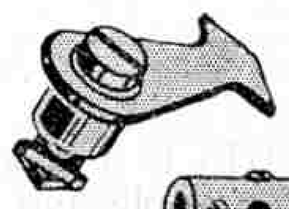
20

24

22

31

57B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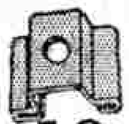
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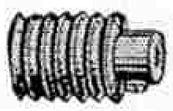
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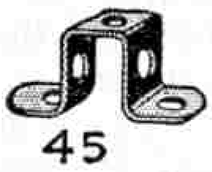
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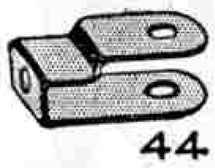
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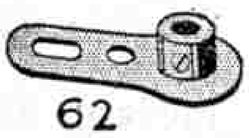
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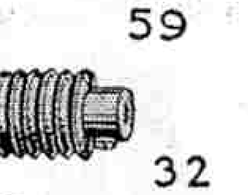
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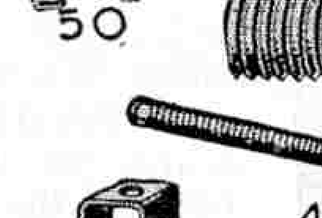
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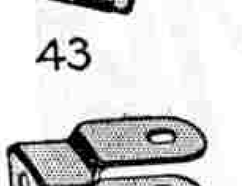
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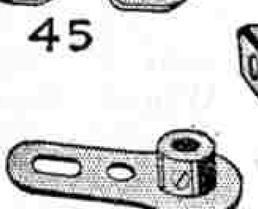
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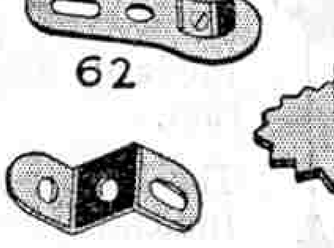
103D

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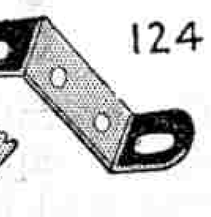
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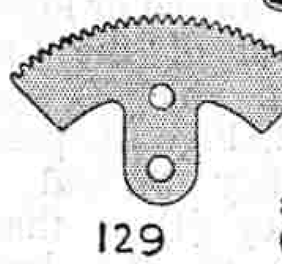

139A

MECCANO

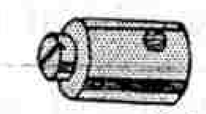
ACCESSORY PARTS

WE illustrate a selection of accessory parts that every Meccano boy will find useful in building the larger and more interesting models. Many of these parts have been only recently introduced, and although we know that they have a universal use (were it otherwise they would not have been added to the system) we may not yet know all their applications. There are endless possibilities in the employment of Meccano parts; indeed, we wonder if there is now a mechanical movement known to engineering that any boy cannot duplicate with Meccano.

		s.	d.
10.	Flat Brackets ... ...½ doz.	0	2
11.	Double Brackets ... each	0	1
12a.	Angle Brackets, 1"×1" „	0	1
19A.	Wheels, 3", with set screw „	0	8
20.	Flanged Wheels ... „	0	6
	Pulley Wheels:		
19B.	3" dia., with set screw each	0	8
22.	1" „ „ „ „	0	4
22A.	1" „ without set screw „	0	2
24.	Bush Wheels ... ... „	0	6
25.	¾" Pinion Wheels ... „	0	6
26.	½" „ „ ... „	0	4
27.	Gear Wheels, 50 teeth „	0	9
27A.	„ „ 57 „ „	0	9
28.	1½" Contrate Wheels ... „	0	9
29.	¾" „ „ ... „	0	6
30.	Bevel Gears ... ... „	0	10
31.	1" Gear Wheels, 38 teeth „	1	0
32.	Worm Wheels ... ... „	0	6
33.	Pawls (complete) ... „	0	4
43.	Springs ... ... „	0	2
44.	Cranked Bent Strips ... „	0	1
45.	Double Bent Strips ... „	0	1
50.	Eye Pieces ... ... „	0	2
57B.	Hooks (loaded) ... ... „	0	5
59.	Collars and Set Screws „	0	2
62.	Cranks... ... ... „	0	3
63.	Couplings ... ... „	0	6
63A.	Octagonal Couplings „	0	8
63B.	Strip Couplings ... ... „	0	8
63C.	Threaded Couplings ... „	0	6
64.	Threaded Bosses ... „	0	2

		s.	d.
94.	Sprocket Chain per length	0	6
96.	Sprocket Wheels, 1" each	0	3
101.	Healds, for Looms ... doz.	0	9
108.	Architraves ... ... each	0	2
109.	Face Plates, 2½" diam. „	0	4
113.	Girder Frames ... ... „	0	2
114.	Hinges ... ... per pair	0	4
115.	Threaded Pins ... ... each	0	2
116.	Fork Pieces ... ... „	0	3
118.	Hub Discs, 5½" diam. „	1	3
119.	Channel Segments (8 to circle), 11½" diam. „	0	4
120.	Buffers ... ... „	0	2
120A.	Spring Buffers ... per pair	0	8
123.	Cone Pulleys ... ... each	1	3
124.	Revsd. Angle Brackets, 1" ... ...½ doz.	0	10
125.	Revsd. Angle Brackets, ½" ... ... „	0	6
126.	Trunnions... ... ... each	0	3
126A.	Flat Trunnions ... „	0	2
127.	Simple Bell Cranks ... „	0	3
128.	Boss Bell Cranks ... „	0	4
129.	Rack Segments, 3" diam. „	0	6
130.	Triple Throw Eccentrics „	1	3
131.	Dredger Buckets ... „	0	2
132.	Flywheels, 2¾" diam. „	2	3
133.	Corner Brackets ... „	0	3
136.	Handrail Supports ... „	0	3
137.	Wheel Flanges ... „	0	4
138.	Ship's Funnels ... „	0	4
139.	Flanged Brackets, Right „	0	2
139A.	„ „ Left „	0	2
140.	Universal Couplings „	0	9
144.	Dog Clutch ... ... „	0	6

You may obtain Meccano Parts from your Dealer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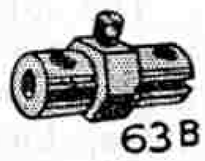
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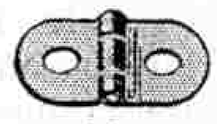
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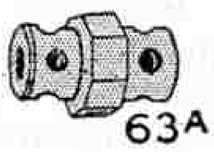
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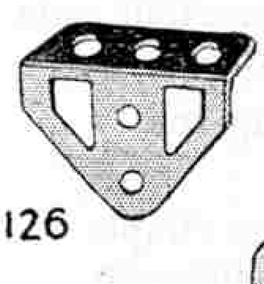
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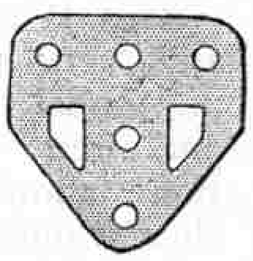
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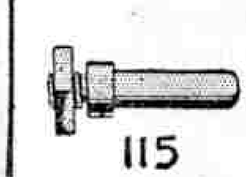
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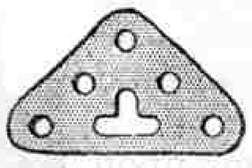
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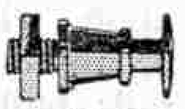
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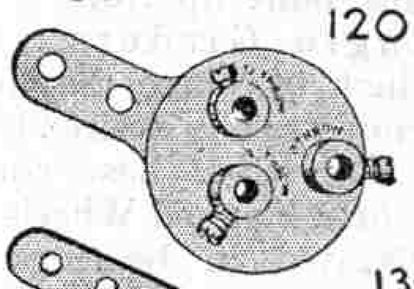
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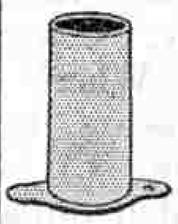
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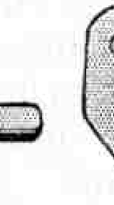
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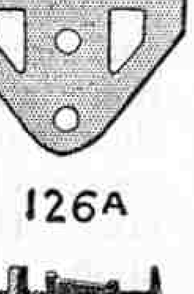
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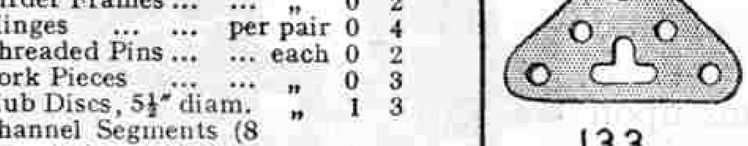
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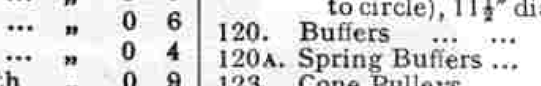
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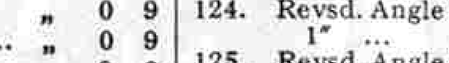
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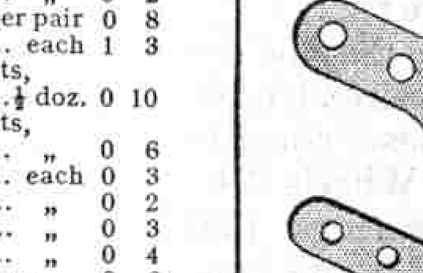
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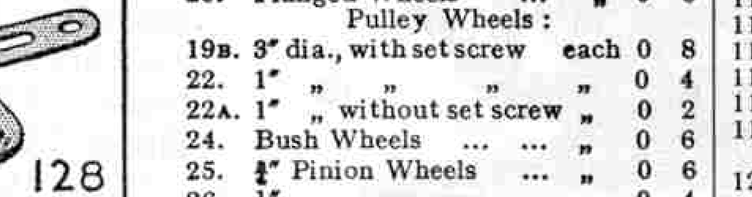
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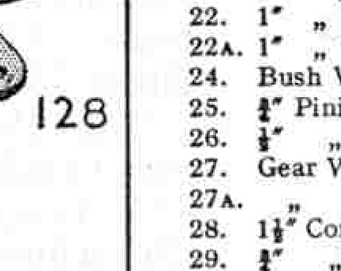
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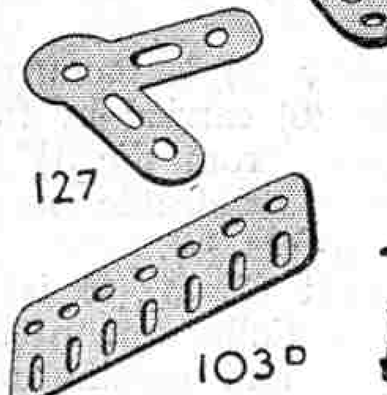
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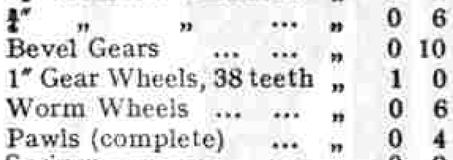
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Automatic Weighing Crane—(*continued from page* 329)

by means of the 57-toothed Gear Wheel (14) and the 19-toothed Pinion (15). On the same Rod as the latter a Crank (17) is secured, which sweeps round the graduated dial (18), so registering the movements of the Chain (9).

Marking the Dial

The dial may be quite easily constructed by cutting out a semi-circular piece of cardboard and marking it in suitable degrees in order to indicate the weight of the load that is being lifted.

In the first place, with a view to ascertaining the correct position for the graduated divisions on the dial, a few experiments should be carried out with some known weights, and the respective positions of the pointer in regard to certain loads must be carefully recorded.

A friction brake is provided to control the hoisting cord. As may be seen from Fig. B, this brake consists of the usual lever and cord engaging a 1″ Pulley mounted on the end of the Crank Handle (1).

It should be noted that the Balls (19) in the Crane bearings have been only recently added to the Meccano system, and have not yet been included in the No. 6 Outfit, but they may be obtained separately. The model works well, of course, if the Jib is mounted on an ordinary swivel bearing, but its operation is greatly improved and better realism effected by the use of the ball bearings.

A counter-balance, consisting of a number of $5\frac{1}{2}$″ and $2\frac{1}{2}$″ Strips, is mounted at the rear of the jib, with the object of relieving the strain imposing upon the swivel-bearing.

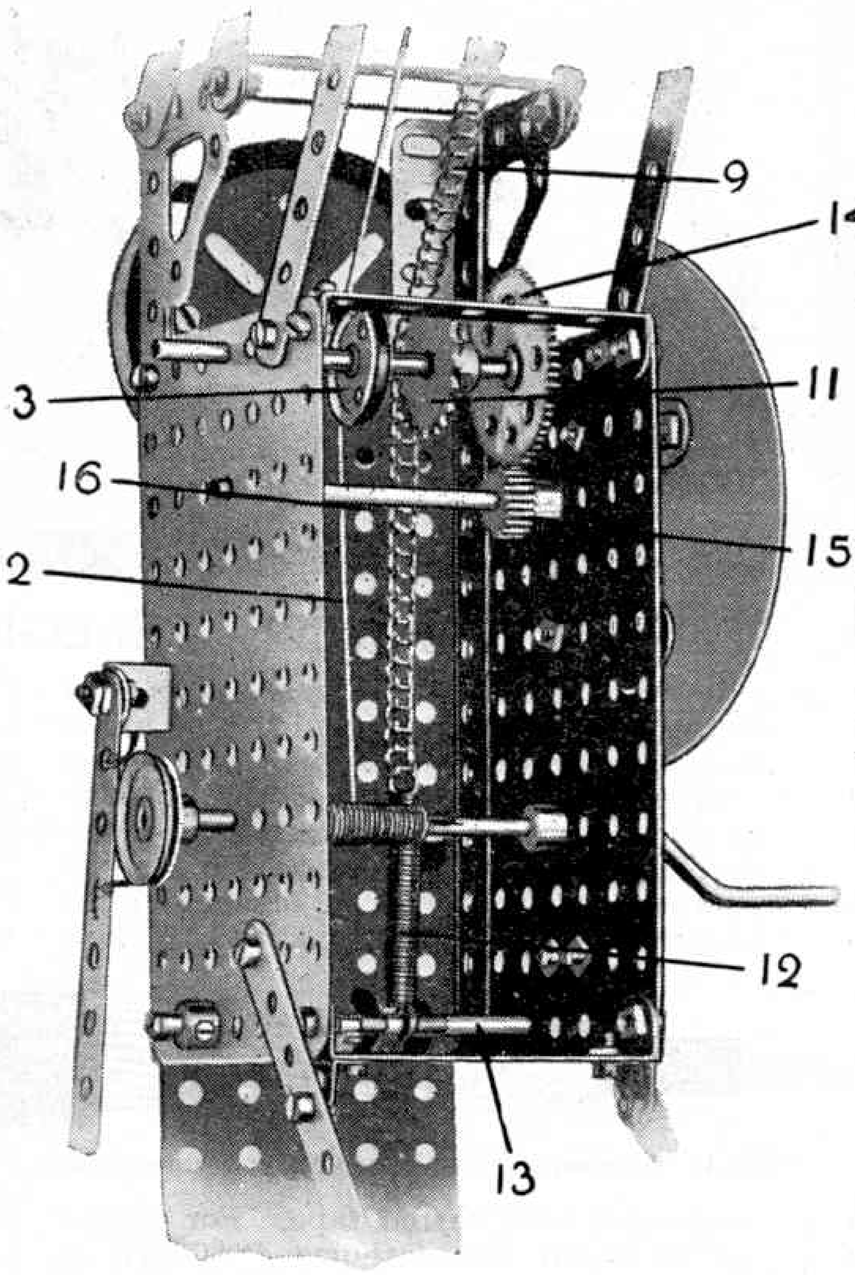

Fig. B

NEXT MONTH:—

HAMMER-HEAD CRANE

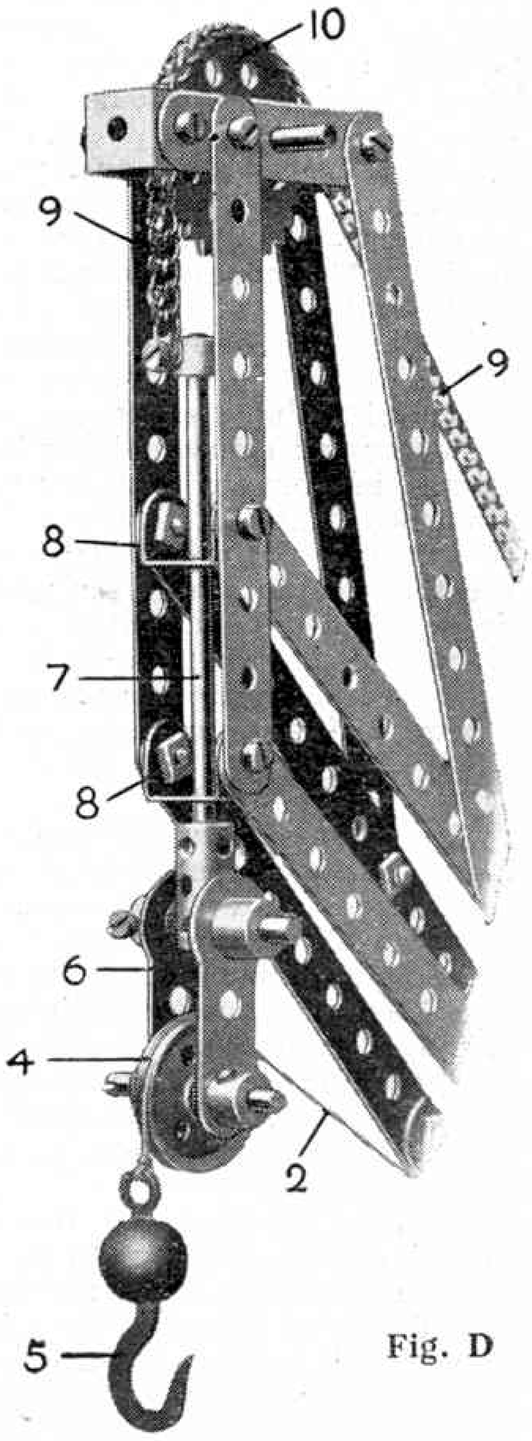

Fig. D

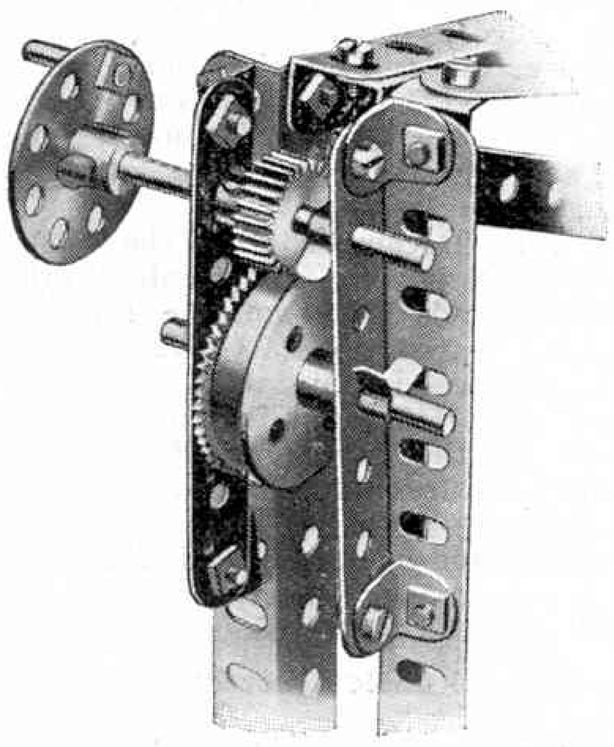

Fig. C

Parts required :

8	of No.	1	2	of No.	19	4	of No.	48A
50	„ „	2	2	„ „	19B	3	„ „	52
2	„ „	2A	4	„ „	20	2	„ „	52A
10	„ „	3	1	„ „	22	1	„ „	57B
12	„ „	4	2	„ „	22A	15	„ „	59
36	„ „	5	1	„ „	24	3	„ „	62
2	„ „	6	1	„ „	25	2	„ „	63
2	„ „	6A	2	„ „	26	1	„ „	70
8	„ „	8	1	„ „	27	2	„ „	77
4	„ „	8A	2	„ „	27A	27″	„ „	94
12	„ „	9	1	„ „	32	1	„ „	95A
5	„ „	11	1	„ „	33	1	„ „	96
30	„ „	12	9	„ „	35	2	„ „	108
2	„ „	14	198	„ „	37	2	„ „	115
5	„ „	16	7	„ „	38	21	„ „	117
2	„ „	16A	1	„ „	40	3	„ „	125
4	„ „	17	1	„ „	43	4	„ „	126A
3	„ „	18A	1	„ „	46	1	„ „	137

How Cranes Help Trade

Port Elizabeth, a seaport town some 400 miles east of Cape Town, is the second city in the colony and is situated on Algoa Bay, about 7 miles south of the mouth of the Zwartkop River. It is built along the base and up the rocky slopes of hills that rise to a height of 200 ft. above the bay.

The Port entirely owes its prosperity to its harbour and it has become the centre for the trade of the whole of the interior of the country lying to the south of the great Zambesi. Previously there were no convenient landing places and so it was impossible for ships to load or unload. Some improvements in this respect were made in 1881 when the old pier was extended to a total length of 900 ft. and a second pier 800 ft. in length was constructed. Since that date even more extensive works have been carried out, and the harbour is now one of the finest in South Africa.

It is interesting to think of the indirect part that Titan cranes have thus played in developing the trade of this wonderful colony—the cranes build the harbour, the harbour enables ships to load and unload, and the town becomes a leading port and the centre of trade for a wide and prosperous area. This is only one instance, of course, of how cranes help the engineer in his work, the execution of which would be quite impossible without them. No wonder, then, that cranes of all types are perhaps the most popular models among Meccano boys.

Electricity

XVII. THE SUBMARINE TELEGRAPH

THE story of submarine telegraphy affords a remarkable example of what may be accomplished by the efforts of a small band of enthusiastic workers fired with a determination to succeed in spite of all obstacles.

By the time that the land telegraph had become commercially practicable, engineers were already considering the possibility of linking continent to continent by means of submarine cables. The most important problem to be solved was that of insulating the cable. With overhead land cables insulation is effected without much difficulty by the use of porcelain insulators at every point where the line comes in contact with anything. With undersea cables, however, the entire length of the line must be insulated from electrical contact with the water in which it lies, because sea water is a good conductor of electricity and, in conjunction with the sea bed, is used as the return "wire" of the circuit.

Early Experiments

The first person definitely known to have sent a current through an insulated wire under water was Colonel Pasley of the Royal Engineers at Chatham. In 1838 he was able to blow up the wreck of the "*Royal George*" at Spithead by means of an explosive fired electrically. In this instance the electrical impulse was transmitted along a wire insulated with tarred rope and covered with yarn soaked in pitch.

In 1840 Faraday and Werner Siemens, working independently, showed that gutta-percha appeared to be the most suitable substance for covering the wire core of a cable, as it was a very efficient insulator, absolutely waterproof, and also pliable and not liable to crack. Since that time scarcely any other material has been used as the primary insulator for undersea cables.

Structure of a Cable

The conducting core of a cable consists of a number of strands of pure copper wire round a central wire of the same metal. The stranded form was suggested by Lord Kelvin in 1854 on the ground that its greater flexibility would make it less likely to damage the insulation when it was bent.

Around the central conductor are coated several thicknesses of gutta-percha and this coating is afterwards covered with jute, yarn or hemp to form a soft bed for the sheath. This consists of galvanised iron or steel wires, each of which is first covered with a layer of tape and a compound consisting of gutta-percha, rosin and Stockholm tar. For the shore end of the cable the layer of hemp and the sheath are repeated and finally the whole is covered with tarred tape. For depths up to about 300 fathoms (1,800 ft.) it has been found necessary to further cover the whole with a layer of thin brass tape to protect the cable from a submarine boring animal known as "*Teredo navalis*," which regards gutta-percha as a great delicacy! Fig. 2 is a sectional drawing of the deep-sea type of cable, shown actual size.

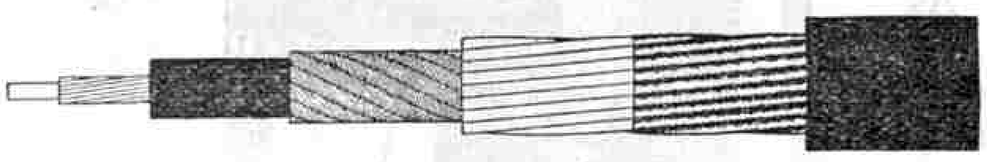

Fig. 1. Diagram showing Wrappings of Deep-sea Cable

First Submarine Telegraph Company

On 16th June, 1845, two bric-a-brac shopkeepers, the brothers Jacob and John Watkins Brett, were sufficiently bold and confident to register the first submarine telegraph company in the world. Their object was to secure telegraphic communication between England and France by means of a cable laid across the Straits of Dover. They applied for Parliamentary permission for this undertaking, but they found that the then Prime Minister, Sir Robert Peel, had no confidence in their proposals. The only result of this application was to set in motion an apparently endless correspondence with various Government departments, and this lasted for some four years. The Bretts stuck to their point, however, and in 1849 they succeeded in obtaining the consent of both the English and French authorities for the laying of a cross-Channel cable.

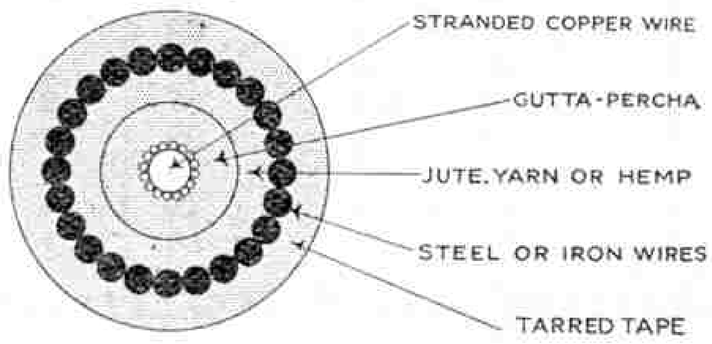

Fig. 2. Section of Deep-sea Cable

The cable consisted of a single copper wire covered with a layer of gutta-percha half-an-inch thick. Leaden weights were attached to the cable at intervals of 100 yards, the fixing of each weight necessitating the stoppage of the cable-laying vessel, a very small tug curiously named "*Goliath*." The cable was safely laid and for one day it worked successfully. It then failed and all efforts to transmit further signals proved fruitless. Shortly afterwards a considerable length of the cable was brought up by a Boulogne fisherman in his trawl.

Short as was the life of this cable, the experiment proved that telegraphic communication between England and France was possible, but abuse and ridicule were showered on the enterprise, its opponents giving a very remarkable exhibition of ignorance. It is said that some people really believed that the cable was operated in the style of the old-fashioned house bell, and that signals were given by pulling the wire!

On 19th December, 1850, the French Government granted to Jacob Brett a concession and the Submarine Telegraph Company was formed. Great difficulty was experienced in obtaining the necessary money from the public, however, on account of the failure of the previous scheme. Matters were looking very hopeless, for only £300 had been subscribed, but the scheme was saved by T. R. Crampton, a well-known railway engineer, who came forward with £15,000.

Cross-Channel Cable Succeeds

A new cable was made, and at the suggestion of a Mr. Kuper, a colliery engineer, it was enclosed in a protective sheathing of iron wires. On 25th September 1851 the cable was laid from the South Foreland to about a mile from the opposite coast, and then, to the dismay of the engineers, it was found that the cable was too short to reach land. An extra length of cable was ordered immediately and was successfully spliced on to the first length and brought to shore. On 13th November, 1851, a public message was sent through this cable, this being the first public communication ever transmitted through a submarine line. The cable proved commercially successful and had a very long life.

The success of this cross-Channel cable led to the laying of a number of cables in various parts of Europe. In 1853, after

two unsuccessful attempts, a cable was laid between Port Patrick in Scotland and Donaghadee in Ireland under the supervision of Charles Tilston Bright, who was then, at the age of 20, engineer to the Magnetic Telegraph Company.

Atlantic Scheme Proposed

About this time the possibility of a cable across the Atlantic was arousing considerable discussion in telegraphic circles. Bright was convinced that telegraphic communication between Ireland and America was entirely practicable, and he used his utmost efforts to bring about the laying of an Atlantic cable. In America Cyrus West Field, a wealthy business man of exceptionally keen brain and extraordinary physical energy, had become interested in the idea of an Atlantic cable, and through his efforts the New York, Newfoundland and London Telegraph Company was formed with a capital of one-and-a-half million dollars. After arranging all landing rights on the American side, Field and J. W. Brett, who had now become his chief engineer, came to London to discuss matters with Bright. The result of this meeting was the formation in this country in December 1856 of the Atlantic Telegraph Company, the capital for which was raised almost entirely in England by the public issue of 350 shares of £1,000 each.

The formation of this company produced a great storm of ridicule, mostly based upon ignorance. It is very strange, however, that so eminent a scientist as Professor Airy, then Astronomer Royal, should have stated seriously that it was a mathematical impossibility to submerge a cable safely to such depths, and that even if this could be done, messages could not be sent through such an enormous length of cable.

Making the Cable

The directors of the Atlantic Telegraph Company set to work immediately with the greatest energy. The proposed route for the cable was surveyed by taking soundings at intervals of about 100 miles and bringing up samples of the sea floor for examination. Meanwhile the construction of the cable was proceeded with, partly at Greenwich and partly at Birkenhead. The length of copper wire used in making the conductor was 20,500 miles, while the outer sheathing consisted of 367,500 miles of iron wire. The total length of wire used was sufficient to go round the whole earth 13 times! The cable was completed in June 1857 and was stowed away on two warships, the "*Agamemnon*" and the "*Niagara*," lent by the British and the United States Governments respectively.

Two Attempts Fail

So far all had gone well, but serious troubles began with the laying of the cable. The shore end was landed in Valentia Bay and paying-out commenced.

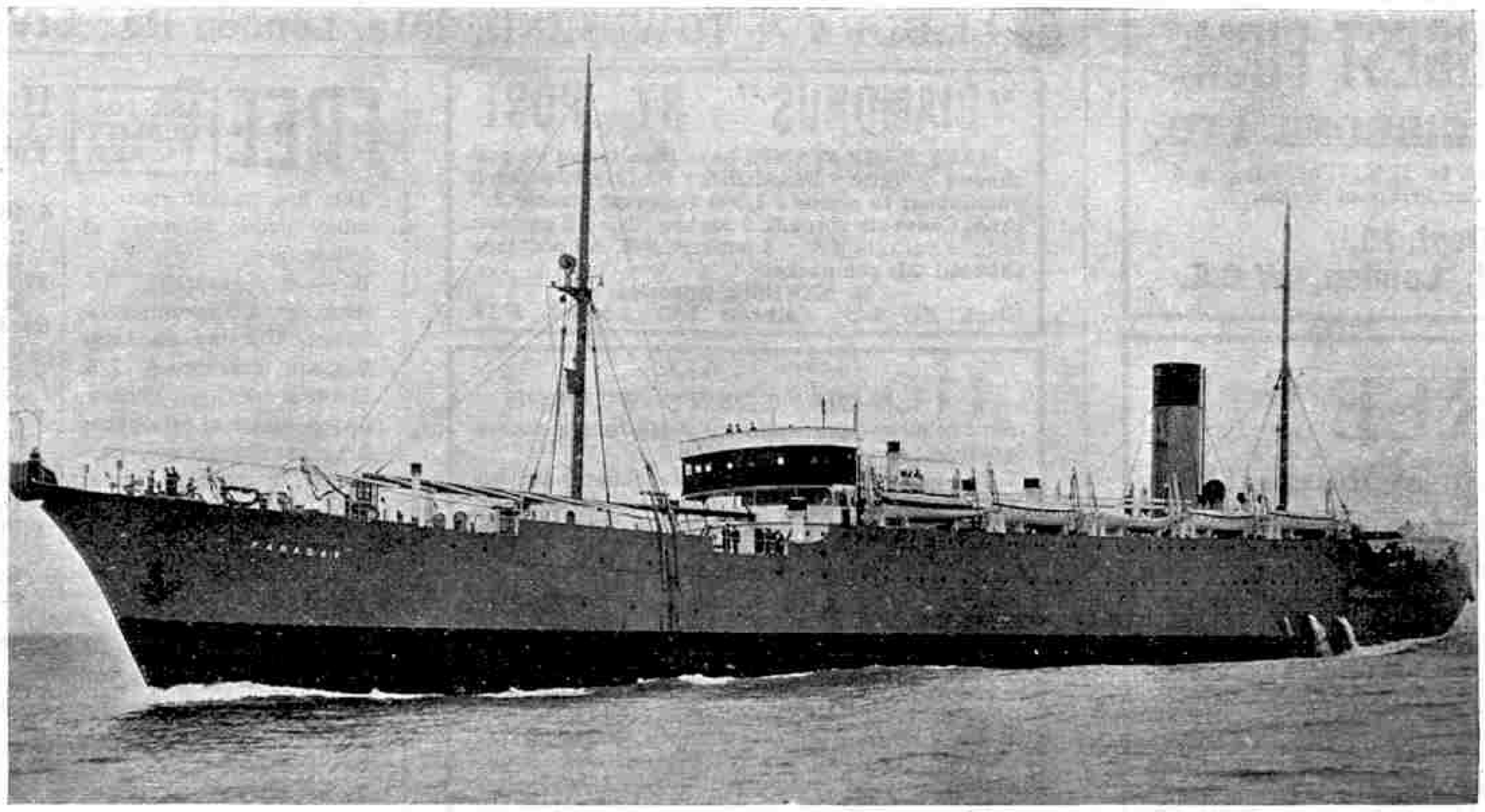

Photo courtesy] [*Messrs. Siemens Bros. & Co. Ltd.*

The "*Faraday*," a modern cable-laying ship

Barely five miles had been laid when the cable somehow or other got caught in the machinery and broke. The lost end was found, by tracing it from the shore, and spliced to the main cable, and paying-out again commenced. For some days all went well, but after about 380 miles had been laid the cable snapped again and was lost at a depth of 2,000 fathoms. This time the cable had to be abandoned and the ships returned to Plymouth.

In the next year, 1858, a second attempt was made with better machinery and appliances and 3,000 miles of cable. This time it was decided that the two vessels should meet in mid-ocean, splice their cables and then proceed in opposite directions towards the two shores. The meeting place was safely reached, the cables were spliced and the vessels started. After the "*Agamemnon*" had paid out about 40 miles it was discovered that the cable had parted at some distance from the ship, and the vessels once again had to meet and splice their cables. This time the cable parted after each vessel had paid out over 100 miles and the ships were obliged to abandon the attempt.

This second failure naturally caused great disappointment and most people felt that the enterprise would have to be abandoned. The chairman of the company advised that, in order to make the best of affairs, the remainder of the cable should be sold and the money divided among the shareholders, but finally it was decided to make one more effort.

On 17th July 1858 the two vessels sailed from Queenstown, spliced their cables in mid-ocean and, after many anxieties and narrow escapes from disaster, the cable was landed successfully on both shores of the Atlantic early in the following month.

Success—and Disaster

On 5th August 1858 the first telegraph message passed between England and America, consisting of an exchange of greetings between Queen Victoria and the President of the United States. Another important message transmitted prevented the sailing from Canada of two British regiments that had been ordered to India during the Mutiny. In the meantime the Mutiny had been suppressed and these regiments were not required, and the despatch of the message saved a sum of about £50,000.

Everything seemed to point to great prosperity on the part of the cable company, but after a short time the signals began to grow weaker and weaker, and at last, after some 700 messages had been transmitted, the cable failed entirely. This failure was a bitter disappointment to the engineers and electricians who had brought the cable into being and it was also a great blow to the general public.

The next point was to ascertain the cause of the failure, and after many consultations of experts it was unanimously agreed that the cable had been damaged by the use of too heavy currents. The setback received was so great that some years elapsed before another attempt could be made, but the idea was never abandoned and during this period the problems involved were studied minutely by experts. During this waiting period the energy of the American, Field, had full play. It is said that Field made no less than 64 crossings of the Atlantic on business connected with the cable, and considering that he suffered intensely from sea-sickness on every trip, we may form some idea of his pluck and endurance!

Another Attempt Abandoned

In 1865 preparations were made for another attempt. This time it was decided to use only one vessel for laying the cable, and the "*Great Eastern*" was chosen for the task. In July 1865 the "*Great Eastern*" set sail from Valentia, escorted by two British warships. After some 80 miles had been paid out, a fault occurred and, after drawing up some miles of the cable, it was found that a piece of iron wire had pierced the coating. The cable was repaired and paying-out continued successfully until over 700 miles had been laid, when another fault was reached and this also was found to be due to a piece of iron piercing through the covering of the cable. It seemed impossible that two such pieces of iron

(*Continued on page* 361)

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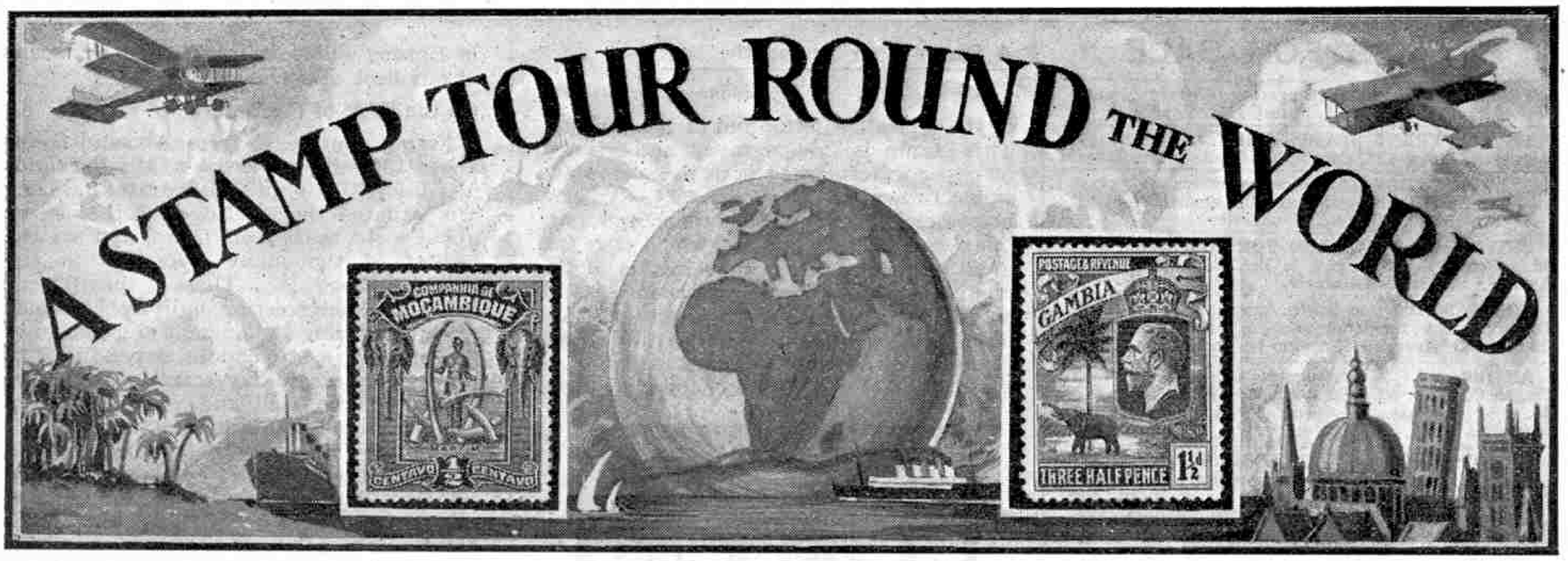

XI. THE MEDITERRANEAN

OUR ship having arrived safely at Casablanca, we make use of our aeroplanes and fly in a southerly direction over Morocco to Marrakesh, sometimes inaccurately called Morocco City.

This town lies on a large plain, and although in the past it has been a very important city (it was founded in 1062 by Yusef bin Tashfin), it is now in a state of decay. As an example of this it may be mentioned that in places the city wall, a structure from 25 to 30 ft. in height, has collapsed so much that pedestrians and often horsemen are able to pass through the gaps so produced.

A concrete of red earth and stone, known as *tabiya*, is the popular building material in this town and the tower of the Kutubia Mosque is the only stone building in the city. This tower is pictured on the 35c. value of the 1917 and 1923 issues of French Morocco and is similar to the Borj el Hasan tower at Rabat, which we shall visit shortly. Both towers were built by the early Moors and, it is believed, both were designed by the same architect, a man named Jabir.

Fez, Volubilis, and Rabat

Flying now due north-east for about 230 miles, we come to Fez, the chief city, although not the capital of the country. It is beautifully situated in a valley on a small river and from a distance appears to be a most attractive place. Owing to its position on sloping ground, Fez has better drainage than most Moorish cities, but the streets are very narrow and dark while, owing to the general dampness, the town is very unhealthy.

The Karueein Mosque, one of the eighteen doors of which is shown on the 10c. is celebrated as being the largest mosque in Africa. The roof is supported by 366 pillars of stone and owing to the large area of the building appears to be very low. It is said that the mosque possesses 1,700 lights requiring three and a half hundredweight of oil for one filling!

Leaving Fez we now turn westwards and passing over the ruins of Volubilis, (2 to 10 frs. values), we come to Chella or Shella near Rabat on the Atlantic seaboard. At Shella are the ruins of Sala, a Roman colony, consisting of a mausoleum of the Beni Marin dynasty (30c., illustrated here).

Continuing we arrive at Rabat, the capital of the country. The city was founded in 1184 by Yak'ub el Mansur and occupies a rocky plateau surrounded by massive but decaying walls. A prominent feature is the Borj el Hasan, already mentioned in connection with Marrakesh. It is depicted on the 1c. value of the series and consists of a square tower 145 ft. in height which has never been finished.

Tunisia—A Roman Aqueduct

From Rabat we fly south-westwards to Casablanca and regain our liner in which we set sail for the Straits of Gibraltar. After passing through this famous gateway of the Mediterranean we continue along the north coast of Africa until the seaport of Tunis is reached.

Outside this town is found the beautiful aqueduct erected by the Roman emperor Hadrian and extending from Zaghwan to Carthage. The ruins consist of hundreds of large stone arches, magnificent remains testifying to the skill of the Roman engineers. Tunisia is, in fact, as rich in Roman remains as Italy itself.

A view of Hadrian's aqueduct was shown in the higher values (35 to 75c., illustrated here) of the 1906 issue of Tunis and in the same issue (1 to 5c.) is shown a mosque at Kairouan. The name of this town is variously spelled Kairouan, Kerouan and Kairawan. It is the "sacred" city of Tunis and is 80 miles south of the capital. The city contains some very fine examples of Saracenic art and although the streets have now been paved it remains very Oriental in appearance. This could hardly be otherwise for the houses are built round a central courtyard in the typical eastern fashion and only present blank walls to the streets.

The Key of the Mediterranean

Rejoining our ship we next pay a visit to Malta—that magnificent island in the centre of the Mediterranean that is so important to the welfare of the British Empire.

On 1st January 1901, Malta issued a stamp with a face value of ¼d. (illustrated) showing a view

(*Continued on next page*)

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Postage extra. Ask for Price List.
ALEC. KRISTICH (N.R.P. 279),
82, MARCHMONT STREET, LONDON, W.C.1.

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F. Ratson (M), Copple House, Fazakerley, Liverpool.

A Stamp Tour Round the World—

(*Continued from page* 335)

of the capital, Valetta, and of the harbour. This stamp is line-engraved and printed on paper watermarked with the customary single Crown CA, perforated 14. Valetta possesses massive fortifications and harbour works on account of which it is the great coaling and exchange station of the Mediterranean. The main island is 91 sq. miles in area and has Gozo (20 sq. miles) on the north-west with Comino (1 sq. mile) between. These with one or two uninhabited rocks complete the

group known under the general name of Malta. The nearest European coast is Sicily about 60 miles away, while Africa is 180 miles distant.

From Malta we continue eastward along the Mediterranean to Alexandria, the chief port of Egypt, situated 12 miles west of an ancient, but now dry, mouth of the river Nile.

Egypt's Beautiful Views

Egypt issued a very fine series of stamps in January 1914, showing views of various famous spots in Egypt. The stamps were engraved and printed by De la Rue and Co. but later Messrs. Harrison and Sons took over the printing. The paper has a chalky surface, watermark star and crescent, perforated 14.

No change was made in the stamps when the British Protectorate was declared on 18th December 1914 and Hussein Kamil became sultan.

In October 1915, the 3 m. value of the 1914 issue was surcharged "2 Milliemes" in English and Arabic. Sultan Ahmed Fuad (now King Fuad I.) succeeded Hussein Kamil in October 1919, and two years later the series was reprinted by Harrison and Sons on paper with a new watermark known as triple crescent and star. An interesting point about these stamps is that the numeral indicating the value is in what we should term English figures in the left-hand corners of the stamps and in Arabic figures in the right-hand corners, while the words "Egypt Postage" also appear in Arabic.

Ras Et-Tin Palace, Alexandria

The 3 milliemes value shows the huge Ras et-Tin palace, built by Mehemet Ali, overlooking the harbour in the rue Ras et-Tin in the Arab quarter of Alexandria. This is on the cape of the same name and is westward of the central portion of the city. The words Ras et-Tin mean "Cape of Figs." For over a thousand years Alexandria was the capital of Egypt, although this position is now held by Cairo, with which Alexandria is connected by rail, telegraph, and telephone. The streets in the central portion of the port are paved with blocks of lava and lit at night by electricity.

At Alexandria we leave our liner for the last time, for the remainder of our tour in Africa and the whole of our tour in Europe will be accomplished by means of our fleet of aeroplanes.

On the Edge of the Desert

Flying south-east from Alexandria for about 130 miles we arrive at the Pyramids of Giza (1914, 4 mils., illustrated). They are situated on the edge of the desert about eight miles from Cairo, and are the largest of the many pyramids in the neighbourhood. These magnificent triumphs of engineering, built by thousands of slaves during the ancient civilisation of Egypt with a stupendous expenditure of energy, remain to-day scarcely altered to testify to the skill and perseverance of the early inhabitants of this land.

Here also is the celebrated Great Sphinx of Giza, often referred to merely as The Sphinx (1914, 5 mils., illustrated, and also all stamps from 1867 to 1906). It is 189 ft. in length and is carved from the solid rock into the shape of a lion's body with a human head. It faces eastward looking over the Nile valley and from the inscriptions in the shrine between its paws it appears to have represented the sun-god Harmachis. It is believed that this sphinx was sculptured to guard the entrance to the Nile valley.

NEXT MONTH:—

EGYPT, ERITREA and DJIBOUTI

Stamps that Cannot be Bought Singly

The United States have issued two new stamps and these have the distinction that no one can buy one! They are to be used for certain classes of mail and are of ½ cent. and 1½ cent. value. The former bears a head of Nathan Hale, the American captain, who was hanged as a spy by the British at New York in 1776. Of this remarkable man it is remembered that his last words were "I only regret that I have but one life to lose for my country!" The 1½c. stamp bears the same portrait of President Harding that appeared on the Harding memorial stamp.

Curiously enough it is impossible to buy single specimens of either of these stamps, as there are no half-cent. coins in circulation.

Air-Mail Stamps

One of the latest "fashions" in stamp collecting is the collection of air-mail stamps, and already some of the early stamps have reached high prices. For instance, when the late Mr. Harry Hawker attempted to win the £10,000 prize for flying across the Atlantic in May 1919, he carried a special bag of letters, which was afterwards rescued. They are marketed now at from £40 to £60 each. When, a month later, the late Sir John Alcock and Sir A. W. Brown made the first direct Transatlantic aeroplane flight, winning the "*Daily Mail*" £10,000 prize, they carried 3 lbs. mail. The envelopes are now worth £35 apiece.

The Martinsyde machine which had to abandon the Atlantic flight carried a bag containing about 60 letters. A few of these were overprinted "Aerial Atlantic Mail—J.A.R." the initials of the Postmaster-General of Newfoundland. They are priced at £100 each to-day.

In August 1910 at Blackpool, Mr. C. Grahame-White carried a mail-bag by aeroplane for a distance of 7 miles. The envelopes are now priced at £12.

The Conquest of the Air

V. A Light Aeroplane with Interchangeable Wings

Courtesy] The Parnall "Pixie III." [*Messrs. G. Parnall & Co.*

IT has been stated that before many years have passed light aeroplanes will be as common as bicycles, and that business men will fly to work, alighting on specially-made roofs in the cities, and close to their offices. Whether this state of things will come to pass remains to be seen. One thing is certain, however, and this is that if their fathers fly to the office, Meccano boys will insist on flying to school! Going to school in such circumstances will indeed be a pleasure, especially if boys are allowed to spend their holidays in the air!

The day of the light aeroplane is certainly quickly approaching, and it only remains for some industrial genius to come along and give us 'planes at a price within the reach of all.

In our March and April issues we gave particulars of an interesting little machine and this month we are able to describe yet another light aeroplane that will be the envy of every reader whose ambition is to possess his own 'plane. This aeroplane (illustrated above) is the Parnall "Pixie," the total weight of which is only 530 lbs., or less than 5 cwts., including fuel and oil.

Top Speed 105 miles per hour

The Parnall "Pixie" was really designed as a single seater light aeroplane for the sportsman who already has some flying experience, although he may not be a fully expert pilot. Fitted with large-surface wings, the "Pixie" is capable of a top speed of approximately 90 m.p.h., a speed quite high enough for those who have not had a great deal of experience. Normally the "Pixie" can land at just over 30 m.p.h. but when small wings are fitted and the machine is flown by an experienced pilot, the landing speed is increased to about 45 m.p.h. with a top speed of 105 m.p.h.

The following are the principal details of the "Pixie III." Overall length: 20 ft. 6 in. Height (as monoplane): 6 ft. Height (as biplane): 7 ft. 9 in. Span of top plane: 26 ft. Span of bottom plane: 32 ft. 6 in. Tail plane span: 8 ft. 4 in. Track: 4 ft. 4 in. Main plane area (monoplane): 138 sq. ft. Main plane area (biplane): 242 sq. ft. Diameter of propeller: 4 ft. 9 in. Air speed · 75 m.p.h.

The "Pixie" is of the semi-cantilever type, the wings being attached to the bottom rails of the fuselage, and braced to the top rails by adjustable streamline struts. This arrangement possesses many advantages including the fact that the pilot sits above the wings and has an excellent view all round and for landing.

Position of Seats

This position for the wings also allows the crew to be practically on the centre of gravity of the machine. Since in an aeroplane of this class the crew's weight represents more than one third of the total, the reduction of the moment of inertia due to this position is important and results in improved response to the controls.

Then again, the low position of the wings gives a cushioning effect when alighting, thus reducing the landing speed. As the tail plane is situated well above the main planes, it is kept out of the main plane "burble" at slow speeds.

It is interesting to note that both wing incidence and dihedral angle may be set with accuracy by means of the adjustable bracing struts, thus avoiding the difficulty in the accurate adjustment of the wings, a disadvantage always found with the true cantilever types.

The fuselage is built of spruce longerons and diagonal struts and fixed together with three-ply gussets. It is completely covered at the forward end with a metal plate, which acts as a shield between the engine and the cockpit. Metal fittings are used at all points of attachment of the engine mounting, wings, tail unit, and under carriage.

The roomy cockpits are equipped with air speed indicator, cross level, aneroid, engine revolution indicator, petrol level gauge, oil sight feed and engine switch.

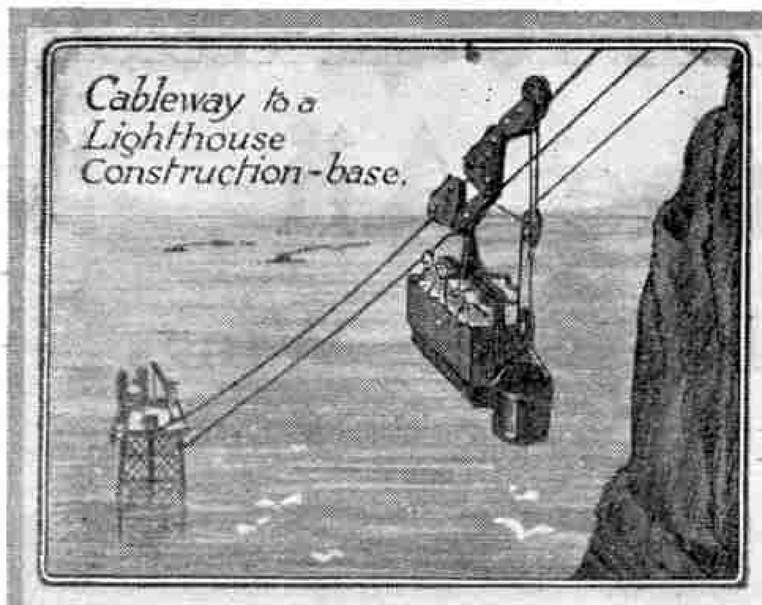
Wing Construction

The main planes are of timber construction and—as in the case of the fuselage—steel fittings are used at all points of attachment.

The wing design is unusual. From the fuselage to a little distance beyond the attachment of the bracing struts the chord is constant and the spars parallel. Beyond this point the front spar carries on straight and the back spar rakes forward sharply to meet the front spar at the wing tip. The aileron spar is hinged to the outer portion of the rear spar, thus giving the aileron a raked forward appearance.

This arrangement renders the wings extremely stiff in torsion which makes for effective aileron control. In this connection it may be mentioned that bad

(*Continued on page* 348)



Engineering News of the Month

New Bridge at Berwick

An improvement to the Great North Road will be effected by a new bridge to be built at Berwick, between the old bridge and the Royal Border Bridge. It is claimed that this will have the longest spans of ferro-concrete in this country, 285 ft., 248 ft. and 167 ft.

* * * *

World's Largest Warship

The United States aeroplane carrier "*Lexington*" when completed will be the largest warship in the world, eclipsing in size even the British battle cruiser, H.M.S. "*Hood.*" The "*Lexington*" will be 900 ft. in length and 106 ft. in width and will be driven by quadruple screws at a speed of 35 knots. Power from four turbo-generators, capable of developing 180,000 h.p., will supply eight electric motors, two driving each propeller.

The vessel will be very fully equipped with a repair shop for wings and fuselage, an optical repair shop, instrument shop, pigeon loft, and complete photographic laboratory, and will carry a crew of 178 officers and 1,498 men.

In appearance the "*Lexington*" will be something of a freak, all her deck structures being built on the port side to allow for a clear space of two acres for the landing and launching of aeroplanes. The hull is so constructed that it is almost shell and bomb proof, while the ship's great speed should enable it to keep well clear of any enemy vessels.

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The Flettner Rotor Ship

In connection with our article on the Flettner Rotor Ship, which appeared in the January issue, it is interesting to note that the German Naval Administration has placed an order with the Weser Concern for the first large Rotor cargo ship, the vessel to be of 3,000 tons.

The order has been placed, in conjunction with the Hamburg firm of Rbt. M. Sloman Junr., and in agreement with the German Shipowners Union, in order that a good practical test may be made of the Flettner design. Regulations for the navigation of rotor ships have now been issued by the German Authorities.

* * * *

Oil Cracking Plant for Baku

For the conversion of mazout into benzine an oil cracking plant is to be erected at Baku by Messrs. Vickers, in conjunction with the Soviet Government. This is believed to be the first time that such a plant has been erected there.

* * * *

The Niagara Cantilever Bridge

Now that the new steel arch bridge over Niagara is in service, the demolition of the old cantilever bridge is going on rapidly. The bridge is being cut away by means of acetylene torches, and this is far the biggest job of its kind ever undertaken in this manner. The work was commenced over midstream, and timber falseworks have been erected on each side of the river to take the weight of the cantilever arms as the bridge is removed.

The demolition of the bridge, which has been in continual operation since 1883, will occupy the whole of the summer.

* * * *

A Birmingham Canal

A deputation, consisting of representatives from Birmingham, Manchester, Liverpool, Stoke-on-Trent, Smethwick, Wolverhampton, West Bromwich and Walsall, recently waited on the Minister of Transport with a view to obtaining financial assistance from the Government for the construction of a canal from Birmingham to the sea. The proposed canal, which would accommodate barges up to 100 tons, would cost altogether over £6,500,000, and would be 82 miles in length, its course being through Wolverhampton to the Potteries and on to the Weaver navigation. It is estimated that by means of the new canal the whole journey would take only 34½ hours.

* * * *

New Reservoir

A new reservoir, capable of holding nearly 300 million gallons of water, is at present being constructed near Huddersfield by Messrs. Lehane, Mackenzie & Shand on behalf of the Batley Corporation. The reservoir, together with the pipe lines to Batley, will cost altogether £500,000 and will take 5 years to complete. Work has now been in progress for some time and the blasting of the main trench was commenced when the first charge was fired at the official opening ceremony in May last.

* * * *

World's Largest Power Plant for New York

The New York Edison Company announce that they are to construct in Manhattan a new generating station costing $50,000,000, with a capacity of 700,000 kilowatts, or 1,000,000 h.p. The new station will be capable of lighting 3,000,000 houses of six rooms each, and its capacity covers the lighting of the whole of the State of New York, excluding New York City. The station will be erected on the water front of Manhattan, so that it will be able to unload coal direct from steamers at the rate of 500 tons an hour.

800,000 gallons of water per minute will be pumped into the station from the East River, being returned almost immediately, so that every 24 hours the amount of water pumped in and out of the station will be 1,152,000,000 gallons!

The power will be generated by means of nine gigantic turbo-generators, each capable of developing 60,000 kilowatts, together with additional machinery bringing the total capacity of the station to 700,000 kilowatts. The General Electric Company of Schenectady have already been awarded a contract for the first two of these generators, each of which will weigh 1,182,500 pounds, and we hope to describe these in a future issue of the "*M.M.*"

* * * *

Huge Circular Saws

A timber company in Everett, Washington, has recently installed the two largest circular saws in the world, each being 110 inches in diameter, containing 190 teeth, and weighing 675 lbs. With these saws 48 in. logs can be cut at the rate of 112 cuts per hour.

* * * *

Mammoth Floating Dock's Voyage

The ex-German floating dock, measuring upwards of 700 ft., which is to be used for docking the battleships of the Mediterranean Fleet, has left Sheerness on its long tow to Malta.

Six naval tugs are towing the great structure, and the dock is escorted by the destroyer Thanet.

* * * *

Repairing Giant Lock Gates

The task of removing and repairing six giant lock gates weighing 160 tons each has just been successfully completed by the L.M.S. Railway at Grangemouth Docks, Firth of Forth.

These great gates, which control the entrance to the docks from the sea, were removed, repaired, and replaced without interfering with the ordinary working of the docks. For the initial task of removal the power of the sea itself was used by the engineers.

The gates, which are hollow, and are filled with water to give weight to them, were emptied and made watertight. The rising tide then floated them off their bearings. They were taken in tow and placed in a graving dock.

After being cleaned and repaired they were towed back to the docks, placed over the bearings at high tide, and with the ebb they sank slowly into position.

* * * *

Waterloo Bridge Bomb

A short time ago, during excavation work at the base of one of the new iron piers of Waterloo Bridge, an unexploded German aerial bomb was retrieved from the mud. The bomb had obviously been dropped from an enemy aeroplane during the war. Had it fallen a matter of twenty feet further westward there would have been no controversy over the propriety and necessity of rebuilding Waterloo Bridge!

American Invention for Seeing by Wireless

Mr. C. Francis Jenkins, an American, claims to have invented an instrument by which moving objects several miles away may be seen by wireless. Successful tests were recently carried out in the presence of Mr. Wilburn, Secretary of the Navy, and other high Government officials. By means of the instrument light is converted into electrical modulations, broadcast on a wave-length of 546 metres, and at the receiving station these are re-converted to light. Mr. Jenkins expects to put his machine on the market during the next twelve months.

* * * *

Watt's Workshop

The contents of the attic workshop in which James Watt worked, together with all his tools, will shortly be exhibited at South Kensington Museum. Everything will be shown in the position he left it at the time of his death in 1819. The actual windows, door, etc., will be used for the exhibit, which will be found close to the Boulton and Watt engines at present in the Museum.

* * * *

Sharp Eyes Win £10

Noticing something floating in the sea, a labourer's wife at Weymouth, stopped to take a more careful look. The "something" proved to be a 21-inch Whitehead torpedo, which had been discharged during practice by the light cruiser Cleopatra. Finders of discharged torpedoes receive a reward of £10 from the Admiralty, the torpedoes being worth about £1,500 each.

* * * *

For Experts only

Schutzengrabenvernichterungsautomobile is the German word for Tank and *Hochdruck-kondensationsdampflokomotive* means High Pressure Condensing Steam Locomotive.

What fun it must be working out a German cross-word puzzle!

* * * *

Corrugated Motor Ship Launched

Messrs. David and William Henderson & Co. Ltd., recently launched from their Clydeside Works a new corrugated ship with a gross tonnage of 5,200, built to the order of Messrs. Peterson & Co., of London, who already own several steamships of this type.

The new vessel, which has been named the "*River Ottawa*," is of the shelter deck type, and has a length between perpendiculars of 400 ft., a breadth moulded of 55 ft. 6 in., and a depth moulded to shelter deck of 37 ft. 9 in. She will be fitted with a Harland and Wolff–Burmeister and Wain Marine oil engine developing 1,850 brake horse power at 90 r.p.m.

* * * *

New London Dry Dock

The Port of London Authority recently sanctioned an expenditure of £715,000 for the construction at Tilbury of a new dry dock 750 ft. in length, 110 ft. in width and 37 ft. 6 in. in depth at Trinity High Water Mark. The dock will be built to the east of the existing docks and will be capable of accommodating the largest vessels at present using the Port of London, as well as the largest likely to use the Port for some considerable time.

* * * *

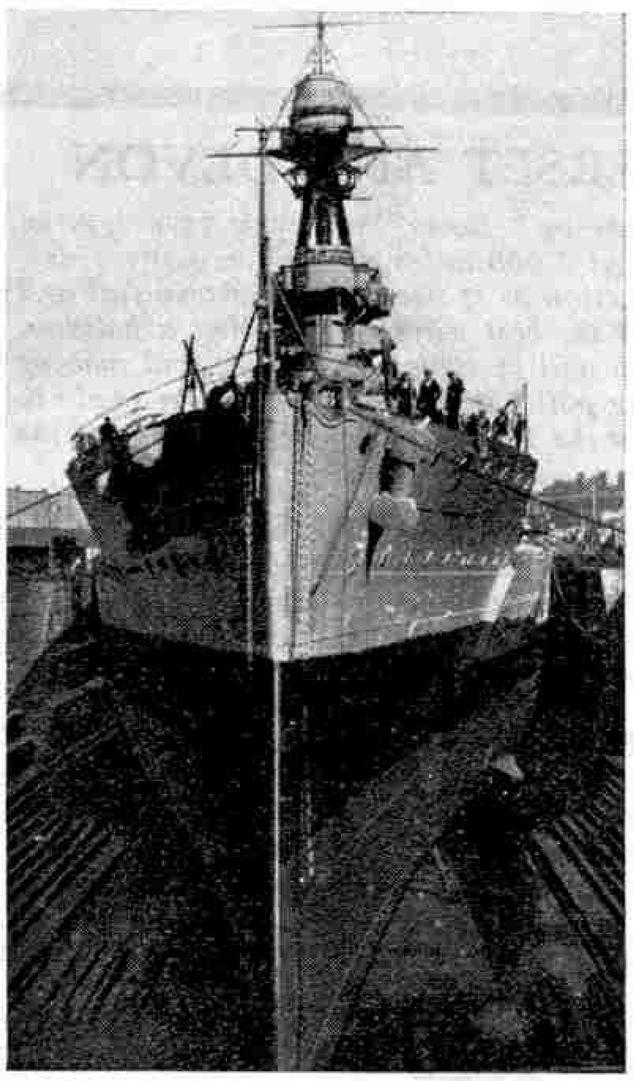
Rugby High-Power Station

Of the twelve 820 ft. masts for the new high-power station which is being erected near Rugby to take the place of 5XX, eight are now complete, and it is expected that the station will be ready for work in November.

New Gates for Birkenhead Dock

The Mersey Docks and Harbour Board have awarded a contract to Sir W. G. Armstrong Whitworth & Co. Ltd., Newcastle-on-Tyne, for three pairs of steel gates for the river entrance of the Alfred Dock, Birkenhead, the work to be completed within a period of 22 months. The dock entrance is 80 ft. in width.

In Dry Dock at Malta



W. H. Cockman of Malta sends the above photograph, showing H.M.S. "*Valiant*" in dry dock at Malta. The vessel, built at Glasgow and launched in August 1914, is of 27,500 tons displacement, 660 ft. in length and 99 ft. 6 in. in width. She is propelled by four turbines, which are supplied with steam by twenty-four boilers. Her armament consists of eight 15-in. guns, twelve 6-in. guns, two 4-in. guns, two 3-in. guns and two 3-pounder guns. She is also fitted with four 21-in. torpedo tubes. Her three anchors weigh 7 tons 10 cwts.

Siamese Gunboat

On 21st April Messrs. Sir W. G. Armstrong Whitworth & Co., launched from their yard at Newcastle-on-Tyne, a gunboat built to the order of the Siamese Navy. The first vessel constructed in Great Britain for any foreign navy since the war, the "*Ratanakosindor*," as the ship will be called, was laid down in December last and is due to be completed next month. She will be 160 ft. in length between perpendiculars 37 ft. beam and will have a normal draught of 10 ft. 9 in. Her displacement will be 1,000 tons.

The vessel will have twin screws, driven by triple expansion engines developing 850 indicated horse power at 150 revolutions per minute, and giving a speed of 12 knots.

Her armament will consist of two 6 in. quick-firing guns, one forward and one aft, and four 3 in. anti-aircraft guns.

Japan's Largest Submarine

A new submarine, the I. 53, has recently been completed for the Japanese Navy. This is the largest submarine yet constructed for Japan. The new vessel is of 1,700 tons displacement, or some 200 tons more than that of their present largest submarine, the I. 51, and is capable of a return trip across the Pacific. The I. 53 is not so large as either the British submarine X1—which displaces 2,780 tons, and was described in our April issue—or the American V. 1. of 2,164 tons.

The new submarine is one of seven being built for the Japanese Navy, and was laid down in 1924, taking only twelve months to complete.

* * * *

New "Beam" Station for Empire Radio

The Post Office anticipate little difficulty in completing the transaction or the purchase of a site at Winthorpe, near Skegness, on which the Marconi Company will erect and equip a station for "beam" transmission of messages to Australia and India. The work will occupy nine months from the date when the site is handed over.

It is hoped that by the time the station is ready those at Bodmin and Bridgwater will also be in communication by the "beam" with Canada and South Africa. None of these three stations will be connected with the high-power Imperial wireless station at Rugby, the "beam" system being worked quite independently.

Similar stations are to be erected in the Dominions concerned, so that within twelve months the distant parts of the Empire should be in close wireless connection by "beam."

* * * * *

Huge Water-Pipe Bursts

The Vyrnwy supply pipe, which burst recently in the district of Llanrhaiadr, is now repaired. Thanks to the immediate action taken by the Liverpool Corporation Waterworks employees in the district no damage of any consequence was done. Soon after the burst occurred the Water Office was inundated with anxious inquiries, but the reservoirs at Oswestry and Prescot and balancing reservoirs en route make it impossible for a shortage to be felt in Liverpool under a week.

* * * *

London Reservoir for 7,000 Million Gallons

The King recently opened at Littleton near Staines a reservoir covering 7,000 acres and costing over £2,000,000. The new lake which has been created during the last ten years will be called the Queen Mary Reservoir and will add 7,000,000 gallons to London's available water supply.

When the King arrived, part of the bottom of the reservoir was covered with water, but this was a very small portion of the total amount that will take a month to find its way from the Thames. The water is pumped unfiltered into the reservoir on the first stage of its journey of about eighteen miles to London. It passes through filter beds of pumping stations en route.

It is interesting to learn that the quantity of water for which the Metropolitan Water Board is responsible is sufficient to supply every inhabitant of the globe with one gallon a day for a week! The new reservoir will make a water shortage in London impossible.

THE OPEN ROAD

A TOUR THROUGH SOMERSET AND DEVON

(The reader is to imagine that he is accompanying "Rover" on a few days' tour in Somerset and Devon. "Rover," who has averaged 5,000 miles a year for many years, will endeavour to give him such advice and instruction as is necessary to obtain full and complete enjoyment from what is perhaps one of the best ways of spending a holiday. It is intended to make for the South Coast, which will be struck at Sealon, and moving westward as far as Torquay, return to the starting point at Bristol by the main road via Exeter and Taunton, etc. The meeting place is at the Tramway Centre, Bristol, and the imaginary time of starting is 9 a.m. on a Saturday.—EDITOR).

HERE you are! and pleased I am to see you, looking so spic and span! Evidently you have profited by my recent advice in preparing for a tour! Quite right—there's nothing like a good start and having made sure our machines are quite "O.K." our chief concern now is the care of ourselves, and that will take up most of our time, I assure you, with all the motors and other traffic on the roads these days. But I see you are impatient to start, and so we will get away at once, for we can talk just as well as we ride along.

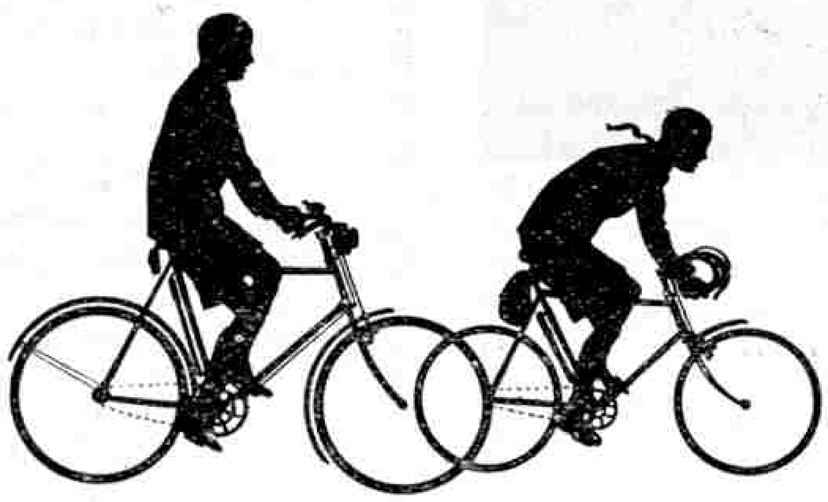
The Clifton Suspension Bridge

I might have mentioned how appropriate was our starting point. There is a tablet in the wall, near where you were standing, that tells us that it was from "This port John Cabot and his son Sebastian sailed in the ship "*Matthew*," and discovered the Continent of America.

Our tour will also be a kind of voyage of discovery, too—not perhaps so much in the fact that it is a new country through which you are travelling, but rather because you will discover new possibilities in yourself. One of these is the ability to get, without the help of train or charabanc, to places that are as yet merely names on the map. Perhaps, also, you will realise for the first time the delight of a long day spent on the "open road," where every turn of the pedal brings to notice something of fresh interest. Finally there is the joy of achievement—but I'm getting too far ahead, so come along we will make a move in real earnest.

Our first place of call will be Wells, which is 20 miles from here due south, and as the wind is N.W. we are favoured for once in having it behind us. The best way out of the town to avoid the traffic will take us past Bristol Cathedral and the Cabot Tower, and will also enable us to get a splendid view of the famous Clifton Suspension Bridge, about which we read recently in the "Life of Brunel" in the "*M.M.*"

I think it a good plan at the beginning of a ride to take certain positions. You will perhaps ride inside, and as I am a more experienced rider I will take the outside. You will soon appreciate this arrangement as we proceed through the town.



Advisable and inadvisable positions for touring.

Ah! there's the famous Suspension Bridge. There's no need for me to say much about it, I'm sure, except to remind you that it connects the counties of Gloucester and Somerset. How closely it compares with Brunel's original drawing. It is a fine structure!

Test Your Brakes

Here we reach our road and may now say "goodbye" to the tramlines for a few days, at any rate. That Church Tower straight ahead on top of the ridge is called Dundry Tower and is a famous landmark in these parts. Our road runs straight up over the hill—some 600 ft. in height and the view from the top is immense—as you will presently see for yourself.

This road we are on is one of two that run from Bristol to Wells, and I have chosen it for special reasons. It often happens that you have the choice of two roads, a fact that in some cases is barely indicated by the map, because the alternative road is shown as a second class road. Often these second class roads are quite good and they suit us even better than the recognised main road. By making enquiries—say from a local cyclist—you can soon satisfy yourself which makes the stronger appeal to you.

In this particular instance the advantage

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of the road we are taking is that it is one mile shorter, and also has less traffic on it. The surface is quite as good, and the hills occur in two groups, instead of in an endless procession of long "ups and downs" that are very tiring.

As we free wheel down this gentle slope, just try your brakes—one at a time of course. We have some "stiffish" hills to descend and it is well to make sure, by a practical test at the start of our run, that they will not fail at a time when they are wanted most. I usually try mine at every hill—before getting to a point where the machine bounds forward. You do this instinctively, if you make it a habit from the start.

Don't Use all your Energy

We are now about to climb the first of the two hills I spoke of just now, and as this is far too steep and long to tempt us to ride up, we will dismount here. I see you are admiring those pretty white flowers in the hedge—they are flowers of the garlic, and are in all the slopes hereabouts. I shouldn't pick them if I were you, for the smell is—well, not what you would expect from a decent English flower!

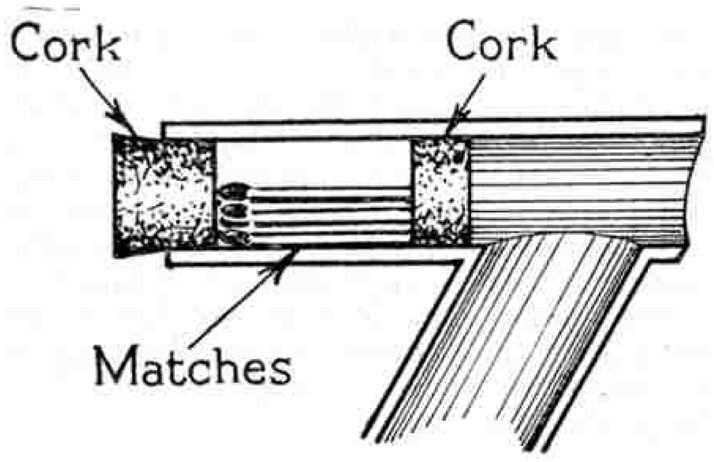
As we are walking this hill I want to say a few words regarding your position in the saddle. You may possibly think it a small matter, but it is really as important as anything, for a wrong seat can easily result in spoiling the whole ride.

You should sit as though you really were part of the saddle itself. That is to say, the action of your legs in pedalling should not interfere with, or produce any movement in, your body.

If you were to make a Meccano model of a bicycle and rider—quite easy, I assure you—I don't think you would allow the action of the cyclist's legs to throw him from side to side in a manner similar to that in which I often see some boys riding. If the rider in your model did this, you would soon bolt him down, I expect! This is the idea that you should get hold of—to sit firmly in the saddle and give *straight* strokes with the legs, thereby getting the maximum of power with the minimum of effort. The movement is entirely mechanical.

About the power, I shall have something more to say later, but let me say now, however, that no cyclist should expend all his energy at once. Remember that it has to be spread over the whole day and, as a veteran cyclist of my acquaintance used to say:—"It is better to have some of to-day's supply left over, than to draw on to-morrow's"—and there is a good deal of truth in that!

Carrying Matches



The above illustration shows an ingenious method of ensuring that you always have matches with you when on a cycling tour or night ride. A small cork is pushed far enough into the saddle tube to allow sufficient room for the length of the matches, which are then inserted and held in position by another cork at the end of the tube. This idea is not confined to matches, of course, as other articles—such as a small tube of rubber solution for instance—can be carried in this manner.

An Easy Riding Position

One other point, while we're on the saddle question. The saddle should be adjusted so that you are able to "sit up and take notice" of things, without having to rely on your handlebars for support. Handlebars were intended chiefly for steering purposes, a function that should be made as easy as possible and not hampered by your weight. Much the same remark applies to the pedals in their relation to the saddle. It should not be necessary to *stand* on them in order to maintain your position.

These apparently insignificant matters become most important on a long ride, and many a stiff neck, wrists, back, and many sore places will be avoided by attention to these details. It is so easy to develop slip-shod habits, which always take their toll generally in a most unpleasant manner! The more naturally and easily you sit, the easier it is to obtain *good balance*, and this has a great deal to do with the pleasure of a day's ride.

The Joys of "Coasting" Downhill

Well, here we are at the top of the hill, and I am pretty well out of breath after all that talking. Look back and see how we have risen in the world! We could almost take a geography lesson from here, for there is a variety of geographical features to be seen in the panorama before us. We also get a very good idea of the "lie" of Bristol, with the Avon running through it almost east to west. That clump of trees on the hill away to the right is called Kelston Round Top and is a notable landmark near Bath.

To the north are the Cotswolds, on the near slopes of which we can pick out many interesting places. Tyndales' Monument at Nibley is fairly prominent, and that is roughly 30 miles distant. We can follow the course of the Severn as far as Berkely quite easily, and even where we can't actually see it, its "silver" reflection shows very plainly. I think it is always very fascinating to stand at the top of a hill and pick out the various landmarks, most of which we previously knew only from a closer acquaintance.

Well, we've had a good "breather" now and as this is only an incident in our day's programme, we'll get on again by enjoying one of the greatest pleasures that the bicycle can give us—a fast but safe "coast."

Don't let her fly away all at once. Wait until you can see all is clear on the hill and then take a firmer grip of your handles. Now! . . . (mere dots are very inadequate, Mr. Printer). Well! What do you think of that? Never experienced such a fine run before, you say! No, I daresay not, but you will have plenty more.

That exhilarating rush through the air gives us some little idea of what it feels like to be in an aeroplane. It is a glorious sensation and acts as a tonic, especially on a hot day. Early in the morning, whilst the air is fresh and the dew still on the fields, the rapid descent of a hill with the country stretching out before you like a beautifully coloured picture, is something that will remain in your memory for many a day to come.

The Little Things Count

Our surroundings are becoming more rustic the further we get from the town. Look at that hedge! Did you ever see such a show of wild flowers. Those Red Campions with the "Scrumyan" and the long coloured grasses intermingled, would make a splendid picture. I was over this road two months ago, and then there was quite a different colour scheme—bluebells and primroses predominated in this same spot. In the field beyond, was a carpet of cowslips and the hedges covered with hawthorne blossom—a very different view to that one gets from the window of a railway carriage.

It is getting somewhat late in the season to hear or see the cuckoo, but there it is! Doesn't that square looking tail, so stiffly poised, remind you of an aeroplane in flight.

It is really splendid going now and it feels good to be alive. That milestone says we have come nine miles, but we scarcely seem to have started. Hello! What's up here! Somebody in trouble by the look of it. Drop off a moment, while I see what's wrong. . . . "Have I a piece of valve rubber? Yes, and of course I can spare you some. . . . Is that enough? Oh, don't thank me, please. I'm only too glad to have been of service to you, Good morning!" . . .

You see, its not only ourselves we have to think of when we make our preparations and it is always "the little things that count"—an inch of valve-rubber made all the difference to that cyclist—it means he will be able to ride instead of having to walk a good few miles.

Yes, perhaps it was thoughtless of him to set off without some spare, but you may be as careful as you like, yet that sort of thing will happen to you someday. Then you will be jolly glad when a good Samaritan comes along!

(To be continued)

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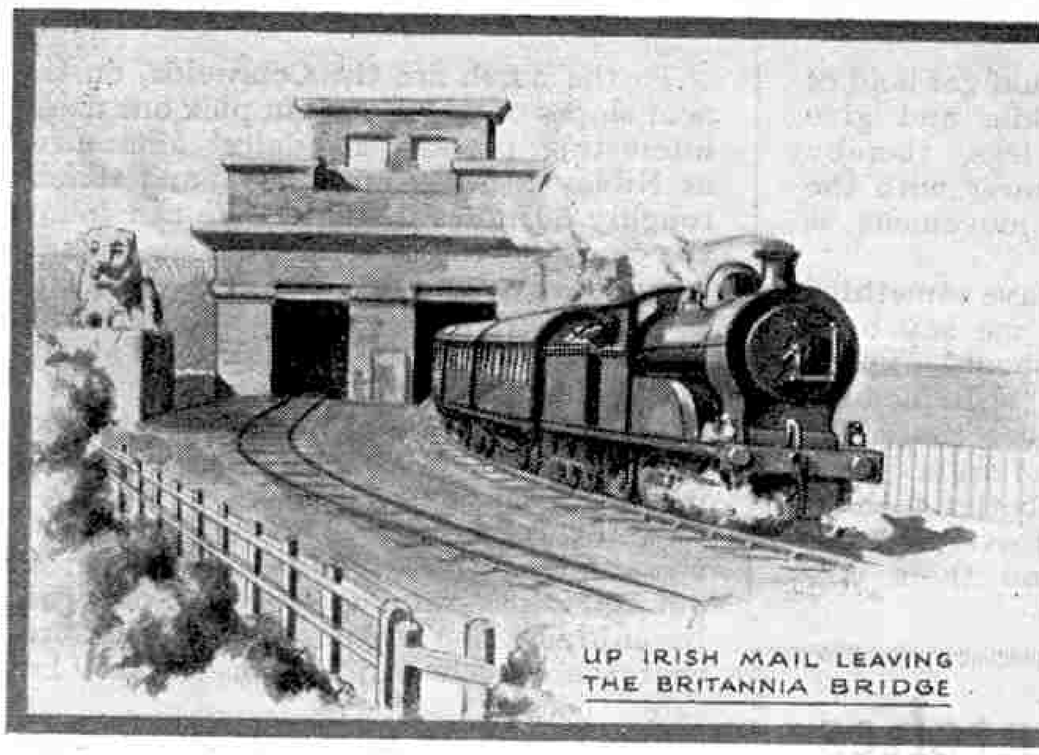


UP IRISH MAIL LEAVING THE BRITANNIA BRIDGE

Railway News of the Month

Grouping Developments

Three passenger locos of the former Highland Railway (Nos. 121, "Loch Ericht," 130, "Loch Fannich," and 131, "Loch Shin") have been rebuilt with new boilers of Caledonian type from St. Rollox Works, Glasgow. These locos formerly had the peculiar "louvre" or slotted chimneys so distinctive in former Highland Railway design.

* * * *

On the L.N.E.R. the majority of important trains on the Edinburgh and Perth services are worked by large 4–4–0 "Director" type locos of former Great Central design, while on the Liverpool and Manchester expresses (Cheshire Lines) the work is shared by G.C. type 4–4–0's of small size, rebuilt with North British-type funnel and small dome, and the graceful Pollitt single-wheelers of the erstwhile G.C.R.

* * * *

The busy Gobowen-Oswestry branch of the G.W.R. is worked by miscellaneous G.W.R side-tank locos of older types, including the neat little 2–4–0 "Lady Margaret," formerly of the Liskeard and Looe Railway.

* * * *

New Locomotives

For the Belfast and County Down Railway, Messrs. Beyer, Peacock & Co. Ltd., have recently built two handsome 4–4–2 type passenger tank engines. With 18 in. × 26 in. cylinders and 5 ft. 6 in. driving wheels, these engines are dealing capably with the Belfast suburban trains for which they were designed.

* * * *

A remarkably powerful series of goods locos of 4–8–2 wheel arrangement has been built by the Vulcan Foundry Ltd., for working heavy trains conveying machinery and stores for the mines in Gold Coast Colony. Although the gauge of the Gold Coast Government Railway is only 3 ft. 6 in., these new engines, complete with tender, weigh no less than 106.4 tons, and have an overall length of 55 ft. 8¼ in.

* * * *

Automatic Gates on Tube Railways

Questions have recently been addressed to the Minister of Transport suggesting that the pneumatically operated doors on the London "tubes" are dangerous. These doors, which close and are pneumatically locked by the guard from his compartment, cannot be locked until they are shut. As the train cannot start until the doors are locked, no one can enter or leave the train until the doors have been unlocked by the guard. By this means the number of men engaged in working the trains is considerably reduced and it has been suggested that this is a possible reason for the complaints of "danger" being made. The Ministry of Transport have had these doors under observation for some time, and are quite satisfied that they are not dangerous.

Railway Mileage of the World

The following figures, showing the mileage of the world's railways in 1922 and published in the German *Archiv für Eisenbahnwesen* for July and August, 1924, has been issued by the Bureau of Railway Economics, Washington, U.S.A. :—

America	371,741
Asia ...	77,961
Africa ...	33,629
Australia	29,203
Europe	228,641
Grand total	741,175

During the next five months we shall give on this page the railway mileage in the various continents.

Furness Railway Exhibit at Wembley

The Furness Railway Company are exhibiting at Wembley their old engine "Coppernob" which was built in 1846. After 60 years' service the loco was placed in a glass house at Barrow-in-Furness station, from where it has been temporarily removed for the Exhibition.

* * * *

G.W. & L.N.E.R. Excursions

With a view to popularising rail travel from London and certain provincial towns to the seaside resorts, the Great Western and London and North Eastern railway companies are introducing half-day non-stop excursion trains at fares ranging from 5/– to 10/– for the return journey. Several of these trains will be run during the summer.

* * * *

Big Locomotive Order

The L.N.E.R. directors have approved an order for 20 passenger tank locomotives from Messrs. Robert Stephenson & Co., Darlington. It is interesting to note that 100 years ago the same firm were entrusted with the construction of "Locomotion No. 1," the first engine of the first public railway in the world.

Signalling and Train Control

On single lines where a simple staff system is employed, block telegraph communication between signal boxes is not necessary. Otherwise signalmen on single lines communicate with one another by bell codes as in the manner used in working double lines. The usual "distant," "home," and "starting" signals are provided on single lines working on the train staff and ticket or electric train staff and ticket systems.

From time to time it becomes necessary to close temporarily one line of a double track, either for repairing or re-laying or as the result of some accident. The remaining line is then worked as a single line under the control of a pilotman, no train being allowed to enter the section unless the pilotman is present and either rides on the loco or gives the driver permission to proceed.

* * * *

New Loco Development

A new and very powerful articulated locomotive of highly advanced design is now being built for the L. & N.E.R. and will probably be completed by the time this announcement appears in print. The new loco is designed on the Garratt system of articulation, and locos of this design, which has been described from time to time in these pages, have achieved considerable success on overseas railways. The new L. & N.E.R. loco will have six cylinders and will be the first of such locos to be placed in regular service.

Other developments promised in the near future are—turbo-locos, constructed on the Ljungstum principle for use on British Railways and very heavy goods locos, of the 2–8–2 type, with three cylinders. We shall keep our readers well informed on these and other similar railway matters.

* * * *

Big Spanish Railway Scheme

A scheme is at present under consideration by the Spanish Directory for the construction of a further 6,000 miles of railway, at a total cost of approximately 5,000,000,000 pesetas (about £152,000,000). Before contracts are signed, the scheme will have to go before the General Staff of the Army and the Council of Public Works for final approval. The actual construction will take 20 years. Another scheme now being outlined by the Railway Council allows for the reconstruction and improvement of the present Spanish Railways.

Locomotive Contracts

Two powerful locos of the Garratt type, each of 25,000 lb. tractive effort, are to be built for the Madagascar State Railways (metre gauge). They have been ordered from a Belgian firm and will be constructed under licence from Beyer, Peacock & Co. Ltd.

An order for eight additional Garratt locomotives, making a total of twelve, has been placed with Beyer, Peacock & Co. Ltd., by the Beira, Mashonaland, and Rhodesia Railways. These locos will be of the 2–6–2: 2–6–2 type and will weigh about 120 tons with cylinders 16 inches diameter by 24 in. stroke, coupled wheels 4 ft. diameter, and a boiler pressure of 180 lbs. per sq. inch. The firebox will be of copper and the boiler fitted with a superheater. Seven tons of coal and 4,350 gallons of water will be carried, and in view of the particularly sandy nature of the country through which these railways pass, the motion will be boxed in. The gauge is the standard of South Africa (3 ft. 6 in.) and the rails weigh 60 lbs. per yard. Sharp curves abound and there are gradients of 1 in 50.

* * *

Branch Line Working Experiment

The L.M.S. branch lines in the Derby district are being used for testing a Sentinel-Cammell steam coach which is 80% lighter than an ordinary branch line train of tank loco and two carriages, and its coal consumption less by 75%. The new train weighs only 16 tons unloaded but can accommodate 56 passengers with luggage and can be driven from either end.

* * * *

Reconstructed 2–6–0 Locomotives

Of the 2–6–0 (S.E. & C.R. design) locos constructed at Woolwich after the war, several were purchased for service in Ireland, necessitating their conversion to suit the broader gauge (5 ft. 6 in). These locos are now working on the Midland Great Western section of the Great Southern Railways, Ireland. They have cylinders 19 in. × 28 in., coupled wheels 5 ft. 6 in. diameter, a working pressure of 200 lbs. per sq. in. and, with tenders, weigh exactly 100 tons.

* * * *

Building a Broad Gauge Engine at Swindon

It is understood that copies of the original drawings are to be used in the building at Swindon of an exact replica of the famous old broad-gauge express engine "North Star." This full-scale model will be exhibited in connection with the celebration of the Centenary of the Railways at Darlington this summer, and will be kept for various exhibition purposes. If only "North Star" herself had been preserved from the scrap-heap!

Boats Race Train!

The news comes from America of a novel speed contest in which fast motor-boats raced a famous express train. The scene of this encounter was the New York-Albany line, which closely follows the course of the River Hudson, and thousands of spectators lined the banks of the river. Two motor-boats of considerable engine power took part, and although one broke down the other completed the course in 165 minutes, or 25 minutes less than the time of the "Twentieth Century Limited" express.

Although the race was followed by aeroplanes from which its progress was broadcasted, the Railway Company assert that the famous American flyer was "not really trying." Anyhow, a train cannot have much of a chance in such an unequal contest.

* * * *

Level Crossings Superseded

A scheme has been outlined for abolishing no less than thirteen level crossings in the Hull district of the L.N.E.R. It is stated that at five of these crossings in the city no less than 35,000 vehicles are held up daily. The cost of the scheme will be over a million sterling, of which the railway company have agreed to pay one-tenth and the Ministry of Transport is expected to be responsible for £800,000.

* * * *

Punctuality on the L.N.E.R.

From recent official records over a period of one month on the L.N.E.R., 206,023 trains were run and the average lateness was less than 2 minutes.

The King's Cross to Edinburgh trains, and those from Leeds and York to Glasgow, averaged less than one minute late.

The Loco of the Future

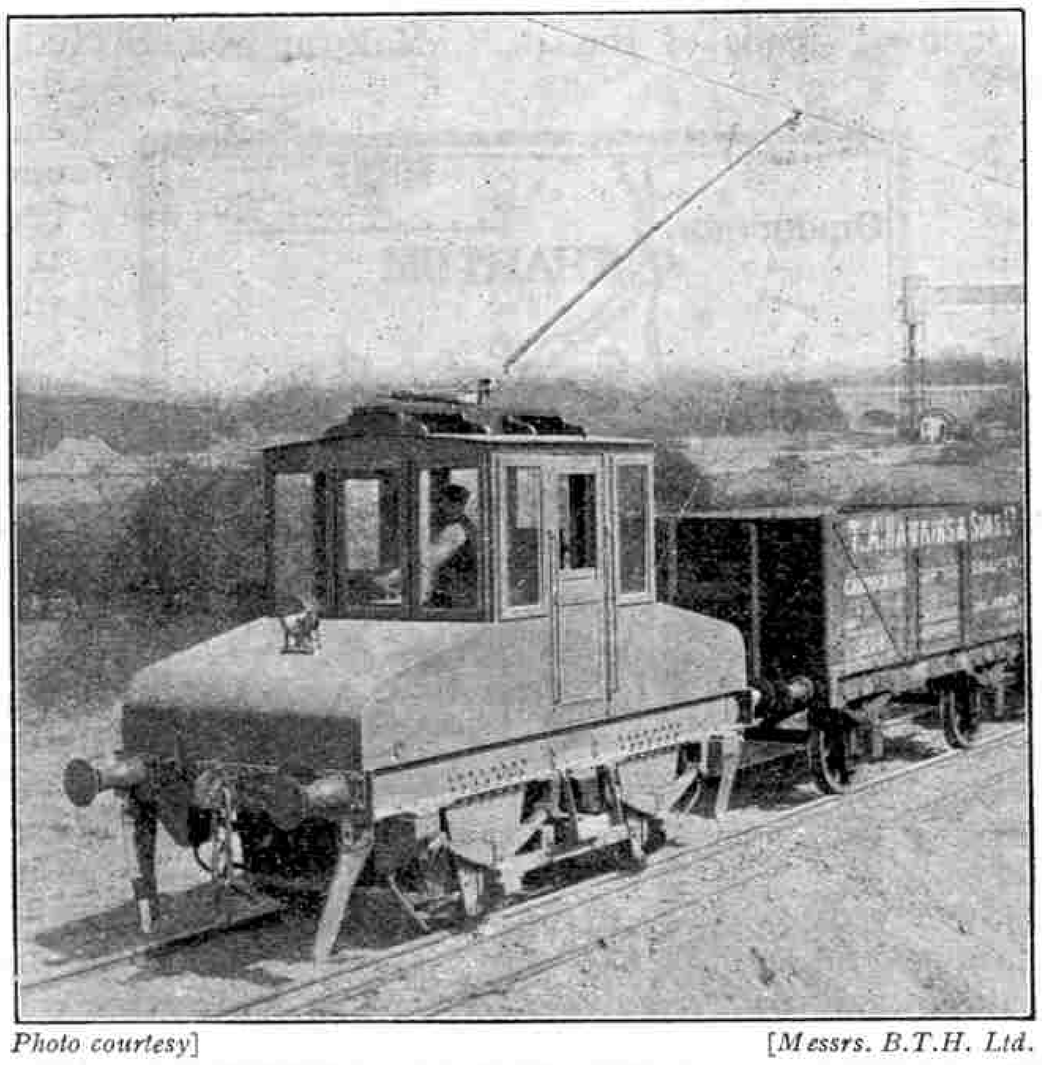


Photo courtesy] [*Messrs. B.T.H. Ltd.*

The Electric loco is said to be the loco of the future. We illustrate a small loco of this type, which is found very useful for shunting and making up trains

New Locos

On the Java State Railways (3 ft. 6 in. gauge) 10 additional Mallet type locos were put into service during 1924. Built at the Hanover Locomotive Works, these machines are 4-cylinder compounds of the 2–8–8–0 type, and are fitted with up-to-date accessories, including air and steam brakes, superheater, and automatic couplers.

* * * *

A new series of locos, 4–8–0 tender type, has recently been delivered to the Madras and Southern Mahratta Rly. (India). These locos are built for the metre gauge, and have two outside cylinders 17 in. diameter by 22 in. stroke, the valve motion being of Walschaert's pattern. An eight-wheeled non-bogie tender accompanies each of these powerful locos.

* * *

A Long Way Round

In connection with the recent loco. trials (when a G.W.R. "Castle" type engine and a L.N.E.R. "Pacific" type were exchanged) it is interesting to note that the transfer of the rival locomotives between King's Cross Sheds (L.N.E.R.) and Old Oak Common Sheds (G.W.R.) was made by way of Retford, Nottingham and the former Great Central main line to Ashendon Junction and vice versa.

* * *

L.M.S. Loco Tests, Preston-Carlisle

The series of tests carried out recently on the difficult Preston-Carlisle section of the L.M.S. main line to Scotland were between four different types of modern express locomotives. Of the Crewe-built L.N.W. type, a 4-cylinder 4–6–0 "Claughton" and a 2-cylinder 4–6–0 "Prince of Wales" took part, while a 4-cylinder 4–6–0 (class 8) Lancashire and Yorkshire Rly. type and a 4–4–0 Midland 3-cylinder Smith compound participated as well.

We are informed that the most successful running was made by the L. & Y. 4-cylinder 4–6–0 No. 10460, which arrived 4 minutes ahead of schedule time with a load of 404 tons (15 bogie carriages). The maximum speed attained was 72 m.p.h., so that the virtue of the run must have been in the first-class work up heavy gradients such as Shap (5 miles at 1 in 75) and Grayrigg (average 1 in 120) Banks.

* * * *

102-Years-Old Locomotive

A locomotive built by George Stephenson in 1823 has been sent from Hetton Colliery, Durham, to the Darlington shops of the L.N.E.R.

The locomotive recently ran a trial under its own steam from Darlington to Shildon, seven miles, and attained a speed of six miles an hour. The loco will take part in the forthcoming Railway Centenary celebrations.

THE SENNAR DAM:

Two Miles Across the Nile

By Harold Shepstone, F.R.G.S.

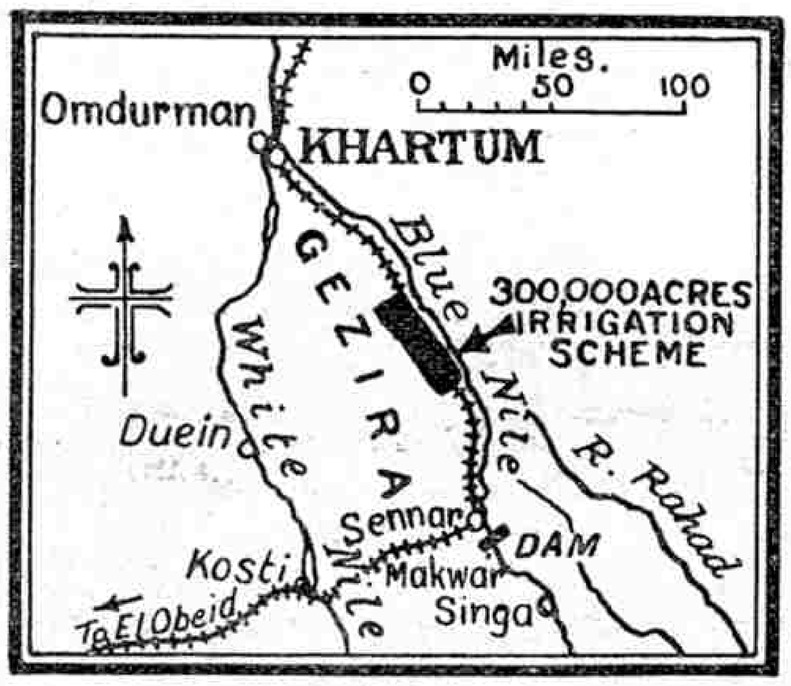
A NATION'S RACE WITH NATURE

AWAY in the Sudan, literally in the heart of the desert, British engineers have won a great victory over the forces of nature. Recently they pitted their cunning against the annual floods of the Nile, and won. As a result there will arise across the Blue Nile, south of Khartum, the greatest dam in the world. It will be nearly two miles in length, will contain over a million tons of masonry and, with its system of canals, will cost over £8,000,000.

Irrigation for Cotton-Growing

The undertaking is not without its political significance. Egypt has control of the Nile from its source, and some of the inhabitants in that country have been using this argument as a pretext for their claim to the Sudan. But the claim does not bear investigation, for more than sufficient water comes down the great river to supply the needs of Egypt, as well as those of the Sudan, several times over. Furthermore, the Sudan will be taking water when it is not required by Egypt, and which would only run away as waste to the sea.

The new dam is called after Sennar, a town near by, and its site is Makwar, formerly an insignificant little village on the banks of the Blue Nile, some 170 miles south of Khartum. As may be seen from the accompanying diagram, the latter city stands at the junction of the White and the Blue Niles. In the fork formed by these two rivers is the Gezira Plain, and the object of the undertaking is to bring a portion of it under irrigation for the cultivation of cotton for the mills of Lancashire.



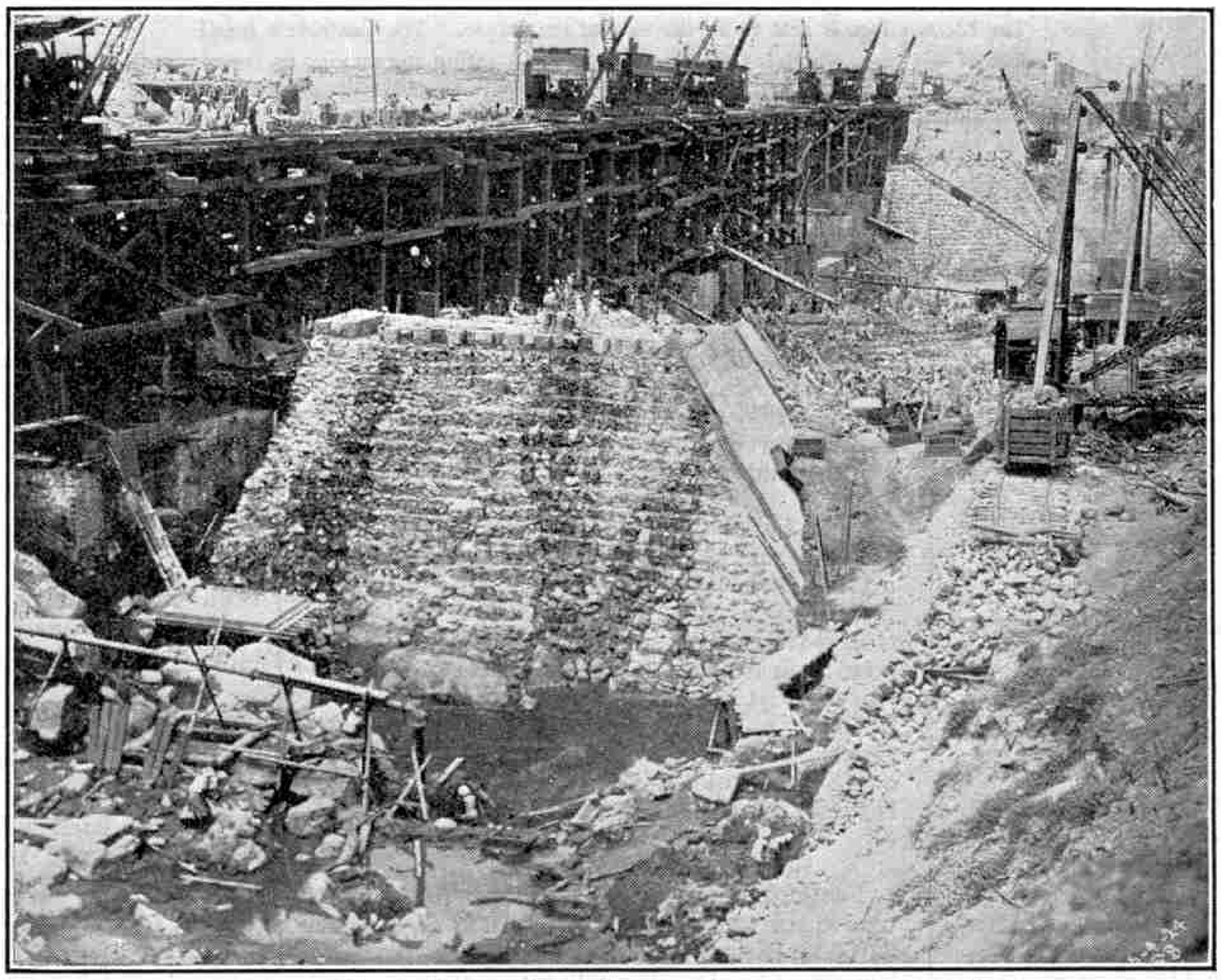
Map showing Sennar Dam

Foundations 40 ft. down

Makwar was selected because at this spot the river is divided by a small island which enables the engineers to deal with one channel at a time, while the bed of the stream is also crossed at this point by a ridge of rock, which was seized upon for the foundations.

The smaller or western arm of the stream was dealt with first. Sudds or earthen embankments were thrown across the channel, both above and below the stream, when the water was pumped out, and work on the site commenced. Along the site of the dam a temporary wooden platform or gantry was built for the cranes that raised the excavated material and lowered the stones for the erection of the great retaining wall.

The foundations go down in some places to a depth of forty feet below what was originally the bed of the stream. The stone of which the dam is being built comes from quarries thirty miles distant.



The Deep Channel Part of the Sennar Dam under construction

Note the Gantry from which the retaining wall was built. The timbers are carried on brick and masonry bases and support a platform on which a number of heavy cranes work

Eighty Huge Sluices

The great barrage will have a total length of 9,925 feet—nearly two miles. The maximum height from foundations will be over 120 feet. At its base the dam will have a width of some 90 ft., gradually tapering to 23 ft. at the top, along which the railway will run.

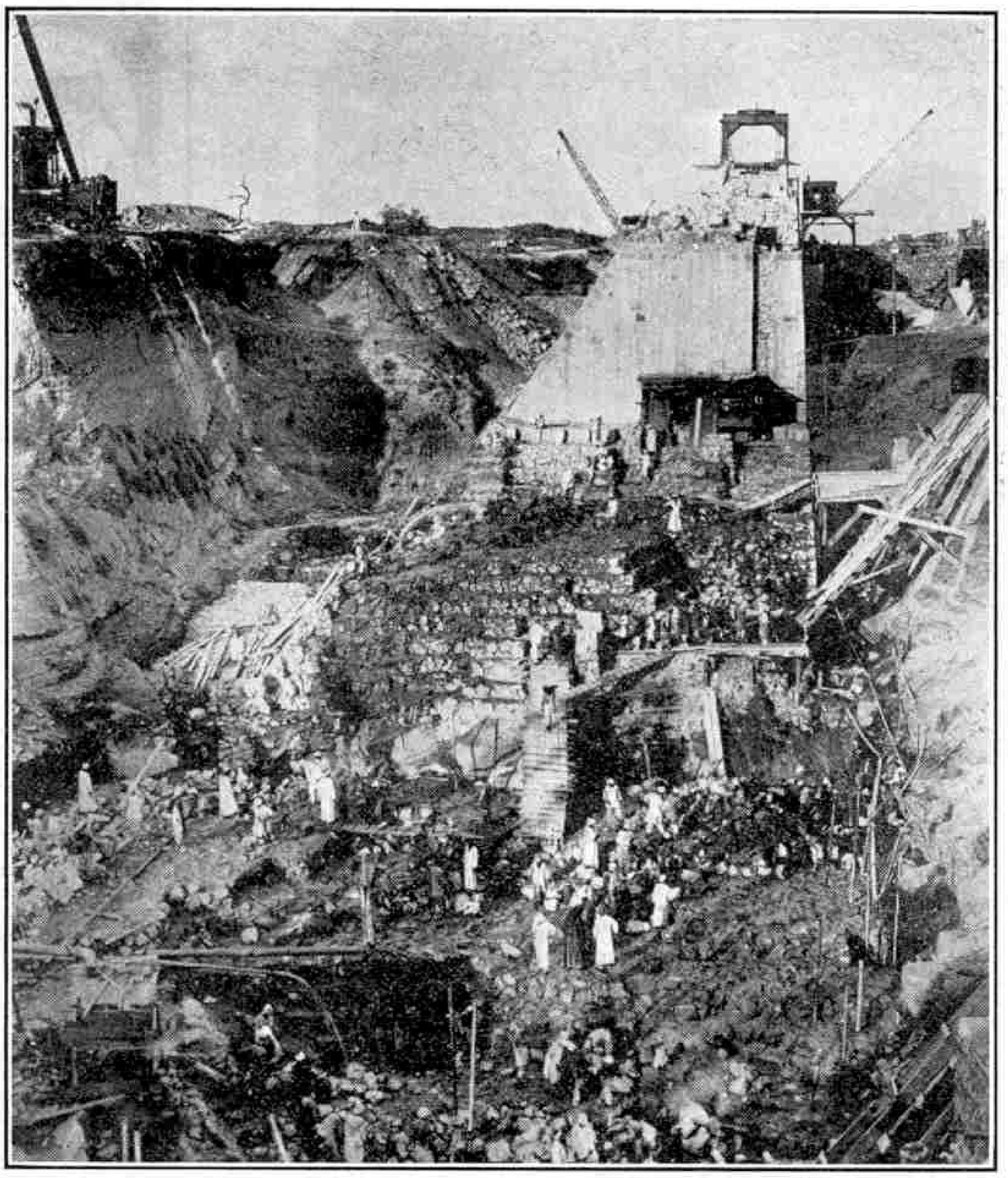
The total weight of the finished structure will be over a million tons. The flow of the stream will be controlled by

means of eighty sluice gates, 27 ft. in height and 7 ft. in width.

After the western section of the dam had been erected up to a certain height above the sluices, work was begun on the eastern channel. This section of the river is not only wider but much deeper than the other.

It was the desire of the engineers to prevent if possible the re-sudding of the channel again another season.

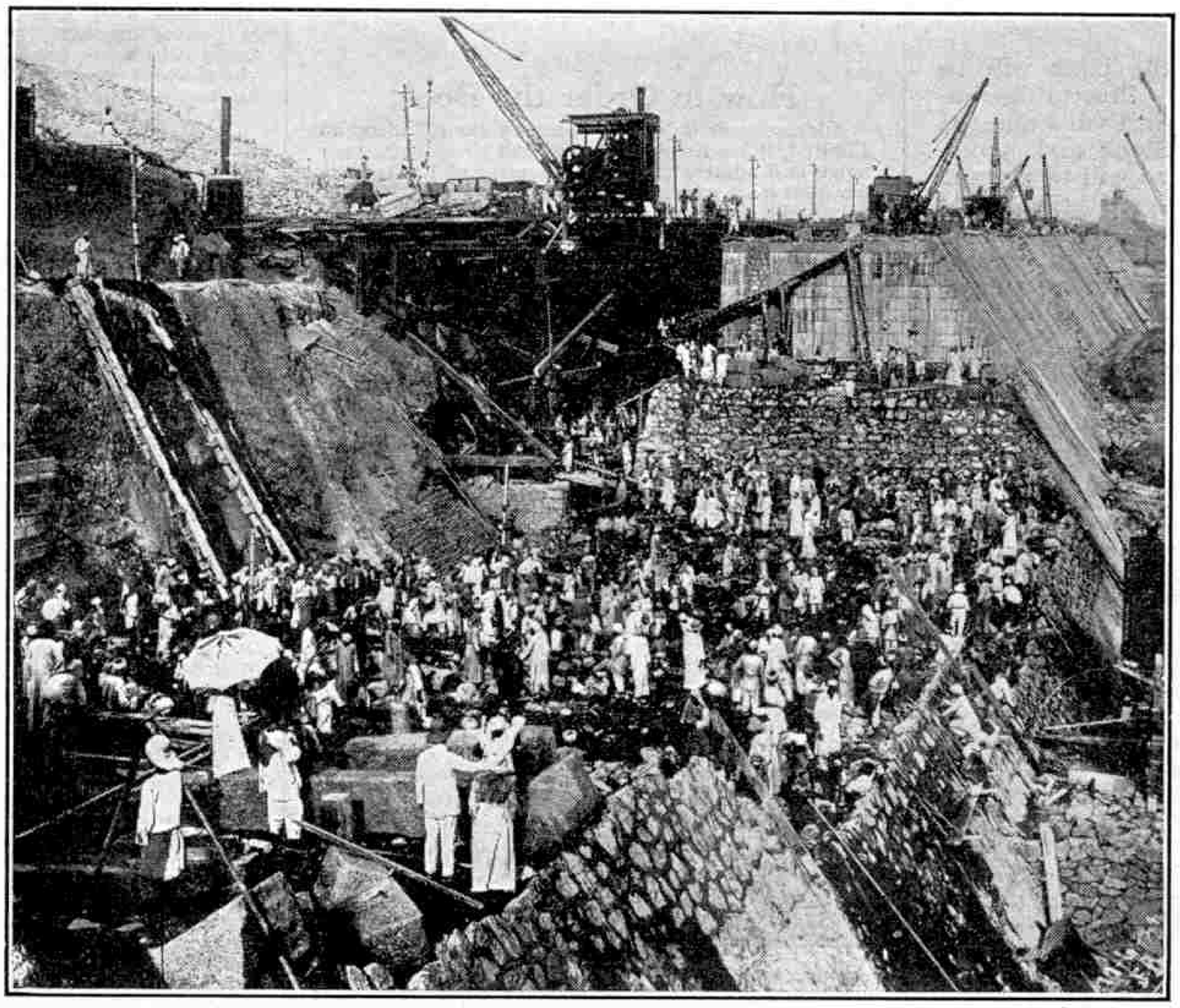
This meant that they had to divert the flow of the stream back again to the western channel, excavate the bed of the stream for foundations, and build up the great retaining wall sufficiently high to allow the remaining work to be continued with the river flowing through the sluices. They had only nine months in which to carry out all this work before the coming of the annual floods, and the question was—could it be done?



Securing the Foundation in deep channel in the eastern section of the stream

A Race with Nature

The engineers made their calculations and declared that it could be accomplished, but it was an anxious time. No one could tell to a week or two when the floods would come, while unexpected little obstacles kept cropping up and delaying the work. But it was pushed on day and night by an army of between 19,000 and 20,000 men and slowly the great wall arose. It had scarcely reached the desired height when the waters commenced to rise, but the engineers had won!



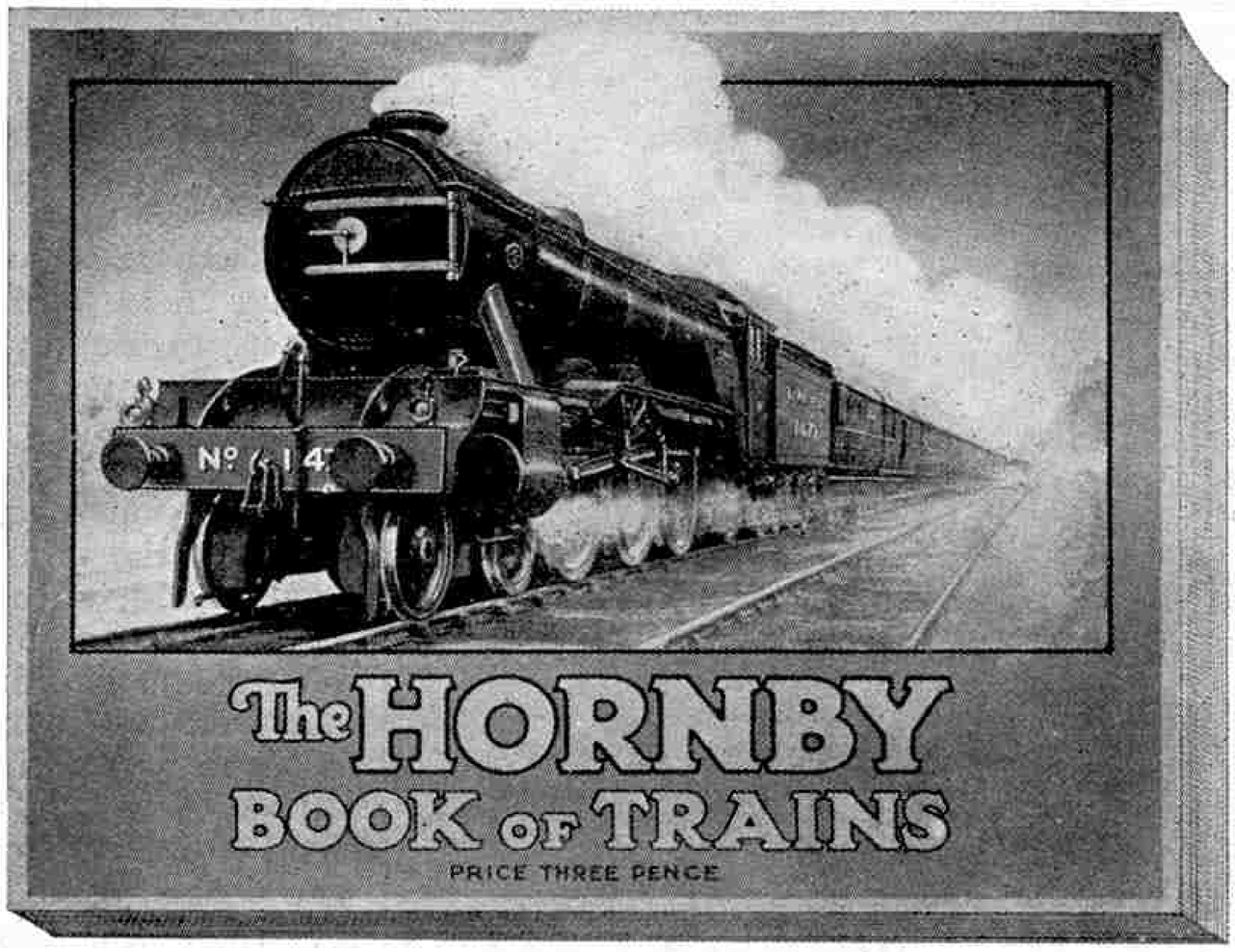
The central portion of the river section of the Sennar Dam under construction. The full height of the Dam is seen on the right

The dam will result in the formation of a lake 50 miles in length, two miles in width, with an average depth of 50 ft. The lake thus formed would hold sufficient water to supply the needs of Greater London for two years.

By means of canals spreading out over the land like the veins of a man's hand, water will be carried on to the semi-parched land. The main canal will be 62 miles in length, in addition to which there are 900 miles of ordinary canals, 3,125 miles of irrigation canals and 5,625 miles of field channels.

If the excavated soil from these canals alone was converted into bricks it would suffice for the construction of a wall five feet in height and one foot in thickness around the earth at the Equator.

As a result of these thousands of miles of channels, some 300,000 acres of what is now virtually desert land will be brought under cultivation, 100,000 acres of which will be immediately devoted to the growing of cotton. From this area 80,000 bales, or 40,000,000 lb. of cotton could be obtained annually. But the cultivated area is capable of great extension, as sufficient water will be held up to irrigate, if need be, three million acres. It should certainly result in the Sudan developing into a great cotton-producing country, and the cry that the Empire should produce its own cotton will have been answered.



The Finest Catalogue in the World

To celebrate this year's Centenary of the locomotive we now have in active preparation a special publication, "The Hornby Book of Trains." It will be a splendid production in every way, and will consist of 40 pages, the measurements being 11 in. × 8¼ in.

The first half of the book will contain an account of the story of the railway from before the time of the opening of the Stockton and Darlington line down to our present-day giant locomotives. Detailed particulars will be given of the leading locomotive types, such as the L.N.E.R. "Pacifics" and the Great Western "Castles."

The second half of the book will be devoted to a beautifully illustrated description of all the Hornby Trains and the latest Hornby Rolling Stock and Accessories. These illustrations will be printed in four colours and the reproduction of the Hornby Trains will be most realistic. Not only will the book be an interesting souvenir of the Centenary, but it will also be the finest train catalogue that has ever been issued in any country.

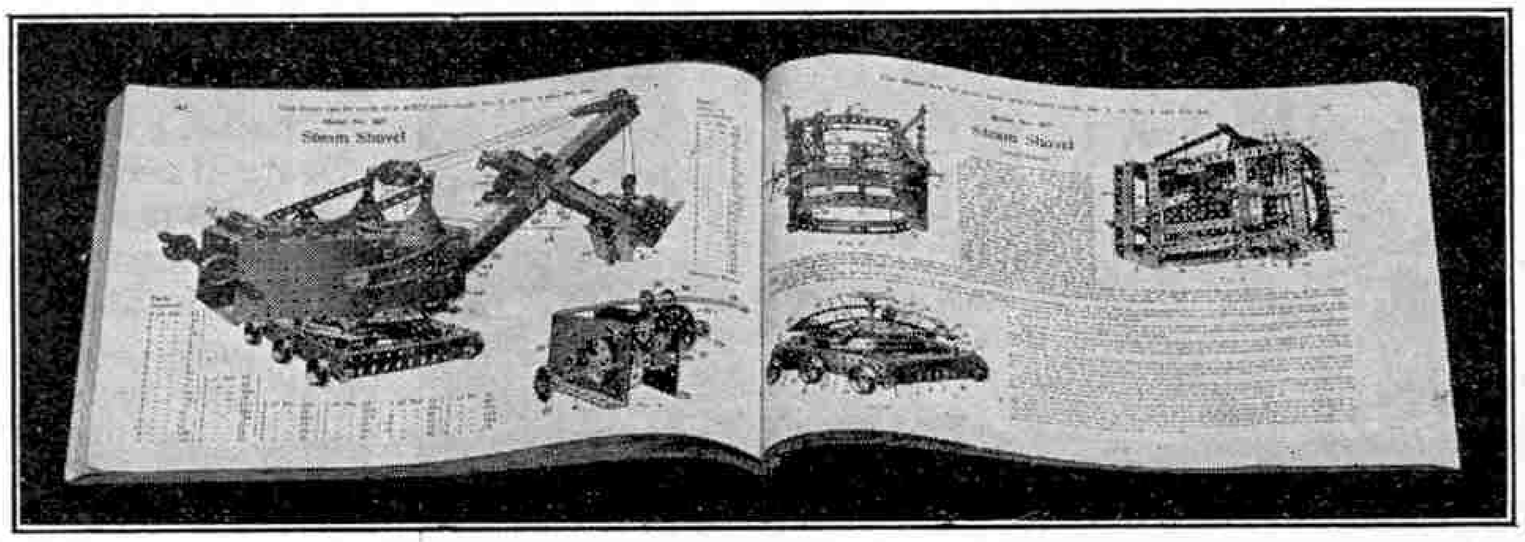
Owing to the great cost of production and distribution, the number of copies printed will be limited, and orders will be executed in strict rotation. It will be a case of "first come—first served."

The Hornby Book of Trains will be ready for delivery in September and *orders may be placed now.* The book will be featured in our advertising later in the year if the supply has not previously been exhausted. It is certain that the demand for this book will be very great, and the purpose of this announcement is to give readers of the "*Meccano Magazine*" an opportunity of "getting in first" with their orders. *Every reader is advised to book an order at once for despatch on the 1st October.*

How to Order the Book

Address your orders to "Hornby Book," Meccano Limited, Binns Road, Liverpool, and please write your name and address clearly. The price of the book is 3d. (post free), which may be sent in stamps. (Overseas price 6d. Overseas orders to be addressed to our overseas agencies, addresses of which are given in column 3, page 376). There is no reduction if more than one copy is ordered. Orders will not be acknowledged. We hope to have the book ready for despatch on the Centenary Anniversary of the Opening of the Stockton and Darlington Railway (27th September). Orders will be entered and executed in the rotation received on this date, or as soon after as possible.

The Meccano Manuals



There are three Meccano Manuals, the 0 Manual for simple models built with the 00 and 0 Outfits, the 0-3 Manual comprising models built with any of the Outfits up to and including No. 3, and the Complete Manual, which comprises a selection of models that may be built with every Outfit up to a No. 7.

Prices of Manuals (Postage Free).—0 Manual, U.K. **5**d.; Overseas, **7**d. 0-3 Manual, U.K., **1/1½**; Overseas, **1/7½**. Complete Manual, U.K., **2/10**; Overseas, **3/10**.

BRIGHT IDEAS

This column is reserved for dealing with suggestions for new parts, new models, and new ways of making Meccano model-building attractive.

W. Frith (Marlow).—One or two of the items you mention are already on the market and we suggest you obtain a copy of our latest list.

E. A. Cryer (Putney, S.W.)—A leaf spring such as you suggest would not serve the dual purpose of road spring and brake band. For use as a brake band it would have to be of very fine flexibility and for this reason it would be unsuitable as a road spring.

L. Corlett (Dalton-in-Furness).—Two couplings and a rod would give a good representation of a connecting rod.

M. Cuffiin (Chadwell Heath, Essex).—We realise that a boiler element would be of value in the Meccano system and expect to communicate some information on this subject shortly.

H. W. Marsh (Sale).—The subject of circular elements always presents the difficulty of determining diameters which have a general application. This is the reason for the seeming protracted delay in introducing them.

Eric W. Bastin (Teddington).—There are occasions when the braced girder does not require a flange—in fact the use of a flange on this particular part is rather the exception. Should an occasion arise at any time where a flange is necessary, this may easily be added by employing an angle girder.

R. Manger (St. Peter-Port, Guernsey).—Should a flange be required on any of the flat plates, it is only necessary to add angle girders of the requisite length. Our present eccentric serves the purpose of a single throw eccentric you suggest, and has the further advantage of providing a selection of centres.

Fred. Lunt (Sunderland).—We keep adding accessories to the Hornby Train series. Many of the items you mention are already in course of preparation.

N. Ward (Wakefield).—We have already introduced a complete universal joint element to take the place of the one constructed from Meccano parts.

J. John (Milford Haven).—We already list a 1½" × ½" double angle strip. Would not this serve the same purpose as your suggested 1" × ½" strip?

T. R. Lake (Yelverton).—(1) We have recently introduced a 3½" gear wheel. (2) A 4–6–0 type loco is getting amongst the larger and more elaborate types, which are generally too big for 0 gauge. At the moment we do not contemplate making anything larger than our present No. 2 loco.

D. J. Woollett (Edgworth).—Rather than introduce an expensive and intricate big-end connection for the crank shaft, we advocate the type of crank built up of existing parts, such as is used on the model horizontal engine, No. 631.

John Watts (Leeds).—Reversed Angle Girders may be constructed by bolting together two standard Girders. The connection between these two pieces is perfectly rigid, which would not be the case with two Angle Brackets forming a reversed bracket, hence its introduction as a single unit.

Fred Greenfield (Barnham, Sussex).—We list a Dog Clutch serving the purpose of your idea.

N. N. Witton (Leeds).—We are at the moment preparing a Double Cross-over Point, which should be ready shortly.

R. A. Col (West Ham).—A cone clutch would be rather a complicated and expensive element made on so small a scale. Two circles composed of 8 Channel Segments in each, together with flanged wheels on a loose frame, demonstrate the wheel race. See the model Pontoon Crane illustrated in our March issue.

Leonard Ison (Northcote, Vic., Australia).—We are surprised to hear that you cannot obtain separate brake rails and suggest you apply direct to the Meccano depot in Sydney. Regret we cannot consider the braced piece you suggest.

Robert Lovelock (Chelsea, S.W.)—We had in mind a worm wheel of a wider pitch, but on examining the subject a little closer we find that it would not mesh with the existing tooth standard of the other wheels.

F. Salter Chapman (Chiswick, W.)—We are of opinion that a leather or rubber faced wheel for use as a friction drive would not be positive enough for Meccano purposes.

Ronald Stacey-Marks (Eastbourne).—(1) There are several parts in the Meccano system that would serve the purpose of the stay you suggest—for example, the ordinary Strip applied at the side, with corner brackets or architraves. (2) A variety of bevel gears would duplicate the functions of the existing Contrate and Pinion Wheels. We introduced the present bevel wheels simply to give a right angle drive in a 1/1 ratio. (3) Perforated strips of greater length than 12½" are very seldom called for. (4) We do not see any advantage in the belt drive over the present cord and sprocket chain.

New Rolling Stock for L.N.E.R.

Quintuple Articulated Units for Great Eastern Section

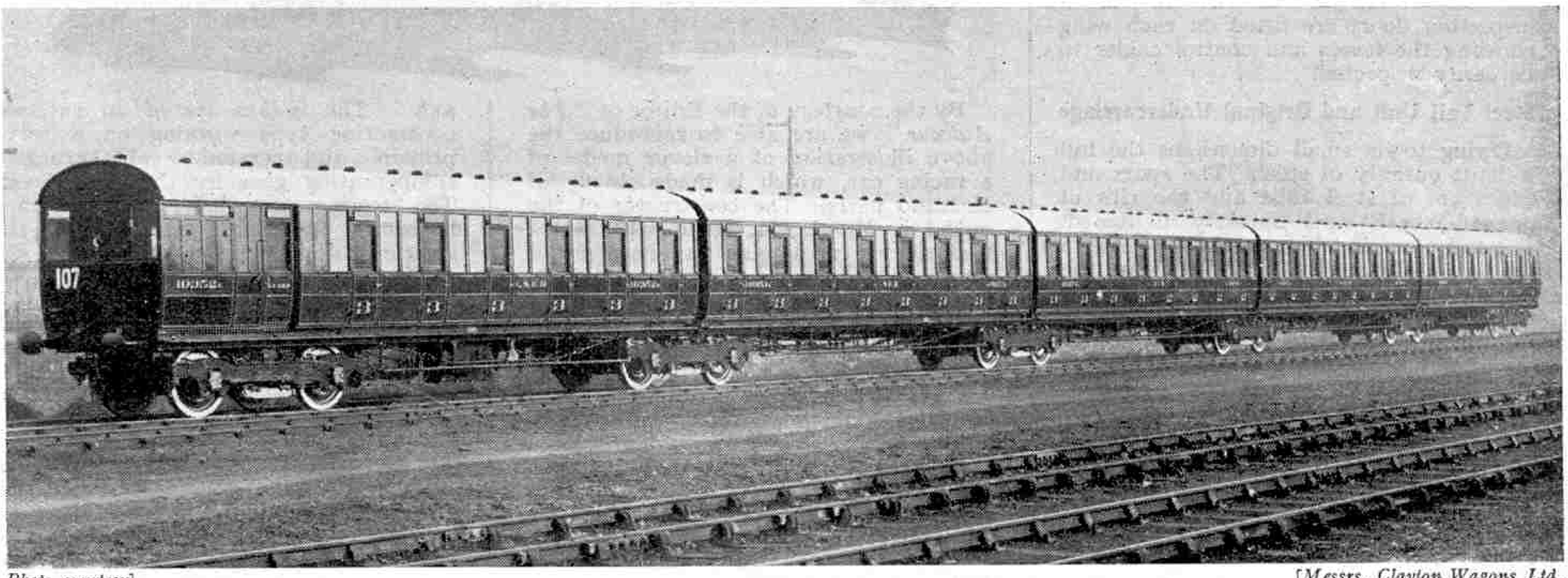


Photo courtesy] [*Messrs. Clayton Wagons Ltd.*

First of 58 L.N.E.R. Quintuple Trains

TWENTY-NINE complete suburban trains, each of ten coaches and each capable of carrying 872 passengers, have been ordered by the London and North Eastern Railway Company. The contract is estimated to involve an expenditure of approximately £660,000 and the work has been distributed amongst the principal carriage builders of this country. Messrs. Clayton Wagons Ltd. by whose courtesy we reproduce the two accompanying photographs, have received an order for six trains, or a total of sixty coaches.

The Articulated System

Each of the new L.N.E.R. trains consists of two separate units of five coaches, each unit being built on the articulated system. This system, which was described a short time ago in these pages, has been applied with great success to the trains running on the L.N.E.R. services between London (King's Cross) and Edinburgh (Waverley). It is an extension of the principle evolved by Mr. H. N. Gresley, Chief Mechanical Engineer of the L.N.E.R., and was successfully adopted in the quintuple dining car trains used in the Great Northern services between King's Cross and Leeds. The system is also employed in the new train sets used on the suburban services to and from the former station.

Carrying Capacity

The new rolling stock is intended for service on the Great Eastern section of the L.N.E.R. Each unit of the two-unit train consists of one third class brake, one third class, one second and third class composite, one second class, and one first and second class composite.

The train consists of eight first class compartments, each with accommodation for ten passengers; thirty second class, with capacity for twelve passengers; and thirty-six third class, also accommodating twelve passengers. The total for the train is thus 80 first class, 360 second class, and 432 third class, an aggregate of 872 passengers.

The total length of each unit is 224 ft. 11¼ in., or 449 ft. 10½ in. for the whole train. The total weight of each unit is 104 tons 14 cwt. 3 qr.

The leading dimensions of each carriage are as follows:—

Length over body	43 ft. 6 in.
Width over cornice	8 ft. 11¾ in.
Width over side commode handles	9 ft. 3 in.
Width over brake compartment at waist	8 ft. 6 in.
Height over ventilators ...	12 ft. 8⅞ in.
Bogie wheelbase	8 ft. 6 in.
Diameter of wheels on tread ...	3 ft. 7 in.
Size of journals ...	10 in. by 5 in. dia.

The bogies are of the "Duplex" bolster type standardised for carriage stock on the Great Northern section of the L.N.E.R.

Rolled Steel Underframe

The underframe of each coach is built up of British standard rolled steel sections, strongly jointed by knees and gussets and stiffened by cross bracing. The solebars are of 10 in. by 3½ in. by ½ in. bulb angle, and the longitudinals of 9 in. by 3 in. by ⅜ in. channel.

The bogie bolsters on the outer carriages are of 10 in. by 3½ in. by ½ in. channel, and the outer headstocks are of 10 in. by 3½ in. by ½ in. channel. The inner headstocks are of 11 in. by 4 in. by ½ in. channel. An adjustable trussrod is provided beneath each solebar and longitudinal.

The buffing spring on the outer carriage consists of a nest of eleven Spencers' No. 430 indiarubber springs, and the draw-spring of a nest of three Spencers' No. 400 indiarubber springs.

Braking and Lighting

The carriages are fitted with the Westinghouse steam heating system, Westinghouse brake and Stone's system of electric lighting. A hand brake is also fitted in the guard's compartment. There are three 14 in. by 8 in. brake cylinders to each unit.

The electric lighting equipment of each quintuple unit consists of two double-battery equipments, mechanically regulated, and each consisting of two batteries of 200 amps. capacity, and a dynamo of 65 amps. output.

Each coach is fitted at one end with magnetic switch and hand control, and the guard's compartment is equipped with control for operating the magnetic switch throughout to "lights on" and "lights off" positions.

Each first class compartment has three 16 c.p. lamps, each in one enclosed fitting in the centre of the ceiling, while the second and third class compartments have two lamps of 16 c.p. in one enclosed fitting. One lamp in each fitting is controlled by a tumbler switch in the guard's compartment independent of the main switch. Three single tail lamps are provided for each brake end, and are controlled by two tumbler switches independently of the main switch.

The Bodywork of the Trains

The body framing, with the exception of the cantrails, is of thoroughly seasoned teak. The cantrails are of pitch pine. The floorboards are of white deal, 1¼ in. thick and laid transversely. The partition doors are of red deal 1⅛ in. thick, tongued and grooved. The roof boards are of red deal ⅞ in. thick, all tongued and grooved.

The roof is covered with raw roofing canvas, bedded in white lead and boiled oil. The doors are fitted with drop lights, and are provided with a wearing plate on the right-hand side of the inside of the light frame to engage with a steel

(*Continued on page* 363)

The Conquest of the Air—

(*Continued from page* 337)

aileron control in monoplanes is almost always due to lack of torsional stiffness in the wing.

The bracing struts and pins by means of which the wings are attached are easily removed, allowing the wings to be quickly and easily folded alongside the fuselage. When this is done the overall width is only 9 ft. so that the machine may thus be easily stored or transported. Hinged inspection doors are fitted on each wing allowing the levers and control cables to be easily inspected.

Steel Tail Unit and Original Undercarriage

Owing to its small dimensions the tail is built entirely of steel. The spars and edges are of steel tube and the ribs of pressed sheet steel suitably lightened. The tail plane is triangular in shape, with the apex forward. It hinges on the fuselage transom to provide tail plane angies. The elevators extend across the whole span of the fixed tail. After disconnecting the operating rods it is only necessary to unscrew two set screws to remove the elevators.

A distinctive and original feature of the machine is the undercarriage. The legs look something like two Pogo sticks and contain compression rubber blocks which are used with a double acting oleo cylinder. Springing is thus obtained from the combined deflection of the tyres, axle, and shock absorber legs.

The tail skid is a straight piece of cane of circular section, fitted with a shoe at its lower end and fixed to the fuselage top member fitting.

The Engine Mounting

The engine mounting is an entirely separate unit from the fuselage, allowing different types of engines to be used. Made of tubular steel with swaged rod cross bracing, it has been specially designed to withstand the shock of persistent misfiring.

Various types of engines may be fitted to the "Pixie" including the 1070 c.c. flat-twin Bristol Cherub, direct drive or geared; the Anzani inverted V twin; the 3 cyl. Radial Blackburne or the A.B.C. engine.

A five-gallon petrol tank is provided and this is fitted with a petrol level indicator, whilst the oil tank holds three quarters of a gallon. The engines are oiled by mechanically-driven pumps.

Convertible to Biplane

The machine is readily converted to a biplane for the use of beginners by the addition of top planes and interplane struts. All "Pixie" machines are very easily handled by means of only a finger and thumb on the joystick, and it is claimed that the machine will fly hands off in all but really bad weather.

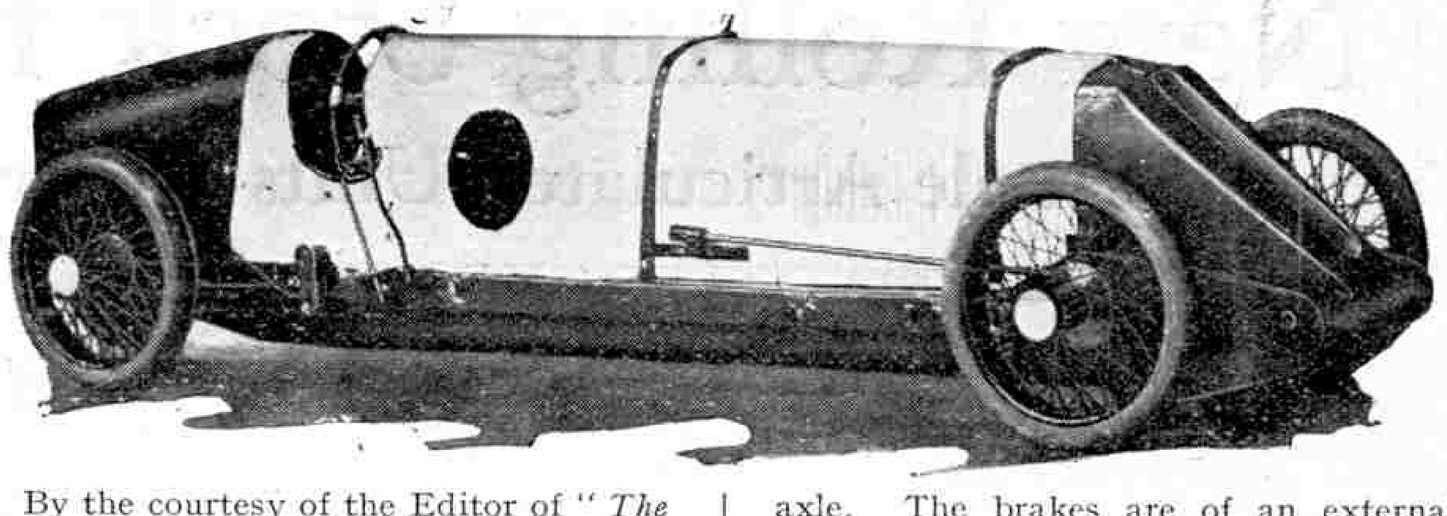
The machine can climb to 4,000 ft. in 15 minutes and has been "stunted" quite a lot. She loops, rolls, and spins very well.

It will be seen that the Parnall Pixie III. is thus an ideal machine for the use of light plane clubs.

NEXT MONTH:—

DE HAVILAND "MOTH."

Another Racing Car in Meccano



By the courtesy of the Editor of "*The Autocar*" we are able to reproduce the above illustration of a clever model of a racing car, which is made chiefly of Meccano parts. The constructor of the model is Mr. D. M. Dent, who states that as yet no engine has been fitted although the small electric motor has run the car very successfully.

The drive is taken through a plate clutch to a three-speed and reverse constant-mesh gear-box, fitted with gate-change, thence by a universally-jointed propeller-shaft to a differentialless back axle. The brakes are of an external contracting type working on a servo principle, and operated by cable through a compensating gear by the hand lever. The steering drop lever is placed in a horizontal position, thus giving the steering column a pronounced rake.

The main body and fairings are made of thin gauge sheet zinc, while the tail is hammered out of sheet copper. The tail, chassis, undershield, and cowl are painted bright green, while the bonnet and scuttle are white. The wheelbase is 26 in. and track 10 in.

Swiss, French and English Railways Compared—(*cont. from page* 325)

only 2 in. The tunnel, which was not actually ready for traffic until early in 1882, cost £2,300,000.

The Simplon Tunnel

The cutting of the Simplon Tunnel was a bigger undertaking than that of the St. Gothard, but the lessons learned in constructing the latter tunnel enabled the engineers to adopt various improvements in order to render the work easier.

During the construction of the St. Gothard Tunnel no less than 800 of the workmen died, mainly through the lack of proper ventilation and means of keeping down dust. In the Simplon Tunnel the ventilation arrangements were all that could be desired—in fact we are told that the current of air was strong enough to blow a man's hat off! The clouds of dust that arose after the firing of each of the blasting charges were laid by opening a valve immediately after each discharge, and thus allowing five jets of water to play upon the splintered rock. The great improvement effected by these means may be judged from the fact that, during the whole period of construction, only 60 lives were lost from all causes.

Triumph of the Engineers

Work on the Simplon Tunnel was commenced in November 1898. For some time all went well, but in 1901 the workmen cutting from the Italian side reached a very soft stratum in which the rock appeared to be alive. The movement, of course, was caused by the enormous pressure imposed by the weight of the mountain above. The strongest baulks of wood were crushed like matchwood and solid iron supports were bent in all directions and finally collapsed. As a last resource the space between the beams was filled with quick-setting concrete, which withstood the strain sufficiently long to enable a thick masonry lining to be built strong enough to resist all pressure.

Another and even more serious trouble was encountered by the Swiss workers. While the Italians were being delayed on account of rock pressure, the Swiss workers got well ahead and reached the centre point first. They then decided to drive galleries down-hill in order to meet the Italian party, but unfortunately they encountered springs of extremely hot water, which ultimately compelled them to abandon the work after erecting heavy iron doors to keep back the water.

By this time the Italian engineers had overcome their own particular difficulties and were pushing on, and shortly they too met the hot springs that had held up the Swiss. In spite of all efforts to keep the temperature within reasonable limits by mixing cold water with the hot streams, work in the main tunnel was impossible. The engineers were far from beaten, however, and by means of gallery and cross-cut they were able to circumvent the springs and push on with the work. Finally on 24th February 1905, the last section of rock was pierced.

Accuracy of Cutting

The remarkable accuracy with which the cutting of the Simplon Tunnel was carried out is shown by the fact that in the total length of over 12 miles the headings were out of alignment only 8 in. laterally and 3½ in. vertically, while the estimate of the total length of the tunnel was only 31 in. less than the actual length. The tunnel cost £3,000,000 or about £150 per yard.

It is interesting to note that the Simplon Tunnel was opened almost exactly 100 years after the completion of Napoleon's military road over the Simplon Pass.

Circular tunnels are also frequent on the lines through the Alps. The Gothard line has seven of these tunnels, and the Albula line of the Rhaetian Railway has five between Bergun and Preda, a distance of only about eight miles.

Bridges and viaducts in Switzerland are generally graceful and imposing and cross valleys and gorges at a dizzy height. The Wiesen viaduct, for instance, on the Rhaetian Railway, is 288 ft. in height and 688 ft. in length, and it crosses the Albula river by a single centre span 180 ft. in width. On the Swiss Federal Railways the Grandfey bridge near Fribourg is 250 ft. in height and 1,252 ft. in length.

(*To be continued*)

FROM OUR READERS

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for this page are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

The Prince of Wales' Train, S.A.R.

A Saloon of special design has recently been constructed in the Pretoria Railway Workshops for the use of the Governor-General. This magnificent carriage was placed at the disposal of H.R.H. the Prince of Wales during his tour of the Union of South Africa.

In addition to the Royal saloon is another special carriage fitted up for the use of the Prince's staff, the two together forming a single unit unsurpassed for luxurious furnishings.

The Royal Saloon, entered by moveable steps, includes a lounge, replete with settee, easy chairs and tables, and fitted with electric fans, telephone, and communication-bells. The windows have either blinds or curtains, and the floor is laid with brown cork linoleum with carpet on top, and all fittings are gold plated. Passing through the lounge one enters the study, equipped with writing-desk, book-case, etc.; the metal fittings being of oxidised bronze. The bedroom and bathroom come next in order, and are furnished with great taste and thoroughness of detail, while the remaining apartment of the Royal Saloon is a boxroom fitted with sleeping bunk for a valet.

Coach "B" consists of four staterooms, entered through doorways leading off the corridor and fitted throughout with bunks, folding washbasins, wardrobes, mirrors, chairs, tables, and carpet. As in the Royal carriage, electrical fittings include ceiling fans, telephone, and bells, while the finish is white enamel and metal fittings are bronze with brass relief. There is a well-fitted bathroom, and beyond that the stoveroom with a "Duplex" boiler and all necessary apparatus for supplying hot and cold water to both carriages.

The train took six months to complete and is claimed to be the finest of its kind in the world. The exterior lines are somewhat in uniformity with S.A.R. standard main line coaches, and it is finished with cream enamel paint with the Royal coat-of-arms affixed to the body sides.

When it is remembered that the standard gauge of the S.A.R. is only 3 ft. 6 in., the triumph of the designers and builders of these splendid carriages will be more readily appreciated.

The two coaches are carried on three bogies, being thus somewhat similar to the latest articulated trains of the L.N.E.R.

The carriages were exhibited at Pretoria Station for an afternoon and evening and six thousand five hundred people inspected them.

ALLAN WATSON (Pretoria).

Carnival at Trinidad

The two carnival days at Trinidad, the 23rd and 24th of February, provide the merriest time of the whole year. During these days the inhabitants of this beautiful island enjoy themselves to their utmost. From early morning until late at night the streets are patrolled by innumerable bands of merrymakers, who seem quite indifferent to the scorching heat of the sun even at midday.

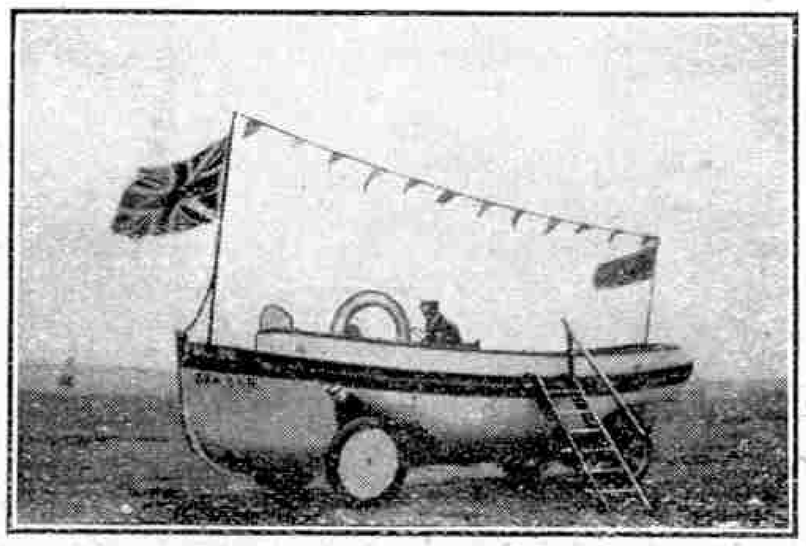
From a suitable point of view such as a high balcony one sees bands of "dragons"—men wearing masks horrible enough to terrify any child—performing hair-raising stunts. Then there are bands of weird-looking "Indians," red, blue, black and even white! These Indians provide plenty of excitement, for whenever two different tribes meet a realistic fight ensues. In the distance may be seen a band of "robbers" "plundering" a spectator in the most business-like manner, and presently round a corner there comes a band of "devils" who perform the most unearthly antics that it is possible to imagine.

Lurking among the crowd are all kinds of curious individuals who style themselves "doctors," "nurses," "tailors," etc. The "doctor" wears a moth-eaten coat and a pair of alarmingly baggy trousers, and carries an old handbag which contains his instruments. Selecting what he considers to be a suitable individual in the crowd, he goes up to him, produces some instrument from his bag, examines his "patient" and in solemn tones pronounces him consumptive or afflicted with some other terrible disease, and thereupon demands £2 as his fee! The "patient" probably tries to dodge, but finally offers to surrender two-pence, which the "doctor" gladly accepts and departs to seek out other victims.

So the carnival goes on, the fun becoming more and more hilarious, until the evening of the second day arrives and the masqueraders, utterly worn out, go home to rest their weary bones.

RALPH GARCIA,
(San Juan, Trinidad, B.W.I.)

A Mechanical Amphibian



A seaside novelty—the "Sea-Car"—A motor car that runs on land and equally well in the sea as a motor boat. Photo by a reader of the "*M.M.*," T. Bennett, of Middlesbro'.

Running Your Own Magazine

Some time ago the Editor of the "*M.M.*" published particulars of a successful little journal written and published by a Meccano boy. There is a saying that "what one man can do another can accomplish," and this applies just as much to the efforts of boys as to the work of older people. At any rate, even if we cannot achieve large circulations for the magazines we produce, we can obtain a great deal of fun and instruction from them.

Amateur magazines may not always be successful, but they can at least be made interesting to the casual person who takes them up out of curiosity, and certainly they are interesting to those who publish them. The production of a magazine particularly appeals to those who belong to a Meccano Club. The Club comprises a group of boys having similar interests and ambitions, and here is an editorial staff in embryo. The suggestion of a Club magazine is almost always welcomed with enthusiasm, and then the first step is to appoint an editor.

In making the choice it is well to remember that the best writer does not always make the best editor. Whoever occupies the editorial chair must have a sense of leadership, and must also have good judgment and a considerable amount of commonsense.

One of the first important points to be decided is the method by which the magazine is to be produced, that is to say whether the copies are to be duplicated or hand-written. The majority of amateur magazines are duplicated. There is no difficulty about this, for there are several cheap duplicators to be bought, and good results can be obtained from them with very little practice. The "make-up" of the paper, the type of articles to be published and the features to be undertaken by special contributors are all matters requiring careful thought, and it is here that the editor has an opportunity of proving his ability.

Last of all comes the subscription list. It is necessary to sound all friends and tell them of the magazine—or better still publish a number of specimen copies to show them—and ask them to become regular subscribers. Unless it is desired to keep the paper for private circulation only, it will be necessary to have a small advertising department.

FRED WALKER (Sankey, nr. Warrington).

G.W.R. and L.N.E.R. Loco Trials

Some Interesting Facts about the Recent Trials

LAST month we published an illustrated article on the locomotive exchange between the London and North Eastern and the Great Western Railways. Particulars and leading dimensions of the locos concerned, together with information as to the conditions of the tests and the expresses allotted to each engine while on "foreign" rails, were also given. At the time of going to press the rival locomotives were then undergoing one week's preliminary working in the opposite company's service. It may be well, however, briefly to recall the circumstances of this very interesting event.

Particulars of the Rival Locos

Representing two distinct but most up-to-date designs of express locomotives, the Great Western "*Caerphilly Castle*" and the L.N.E.R. "*Flying Scotsman*" stood almost side to side at Wembley Exhibition last year. The latter was stated to be the most powerful loco in the kingdom and it was very natural that keen curiosity was aroused as to which of the two locos could put up the better performance.

The Great Western loco is of the 4–6–0 type, simple with 4-cylinders, comparatively moderate dimensions, but extremely high boiler pressure of 220 lbs. per sq. inch. Its rival is one of the famous L.N.E.R. Pacifics, the wheel arrangement of this type of loco being 4–6–2. It also has three simple cylinders taking steam at the very moderate pressure of 180 lbs. per sq. inch.

In the matter of boiler dimensions and heating surface, the Pacific is much the larger machine, however, for her boiler is 28½ ft. in length with 2,930 sq. ft. of heating service, against 25 ft. length and 2,050 sq. ft. of heating surface.

The respective weights are, Pacific 149 tons, and Castle 120 tons, both including tenders.

The Trials Commence

For the purpose of the trials, the L.N.E.R. Pacific 4474 worked important G.W.R. expresses including the celebrated "Cornish Riviera" and was paired for alternate working with the home company's loco 4074 "*Caldicott Castle.*" On the L.N.E.R. (the old Great Northern) main line, Great Western loco 4079 "*Pendennis Castle*" was set to work fast and heavy trains, including the "Flying Scotsman," as far as Doncaster, her stable companion being the L.N.E. "Pacific" No. 4475. After a week's preliminary running of the locos over the new ground, the actual trials commenced on Monday, 27th April and continued throughout the week.

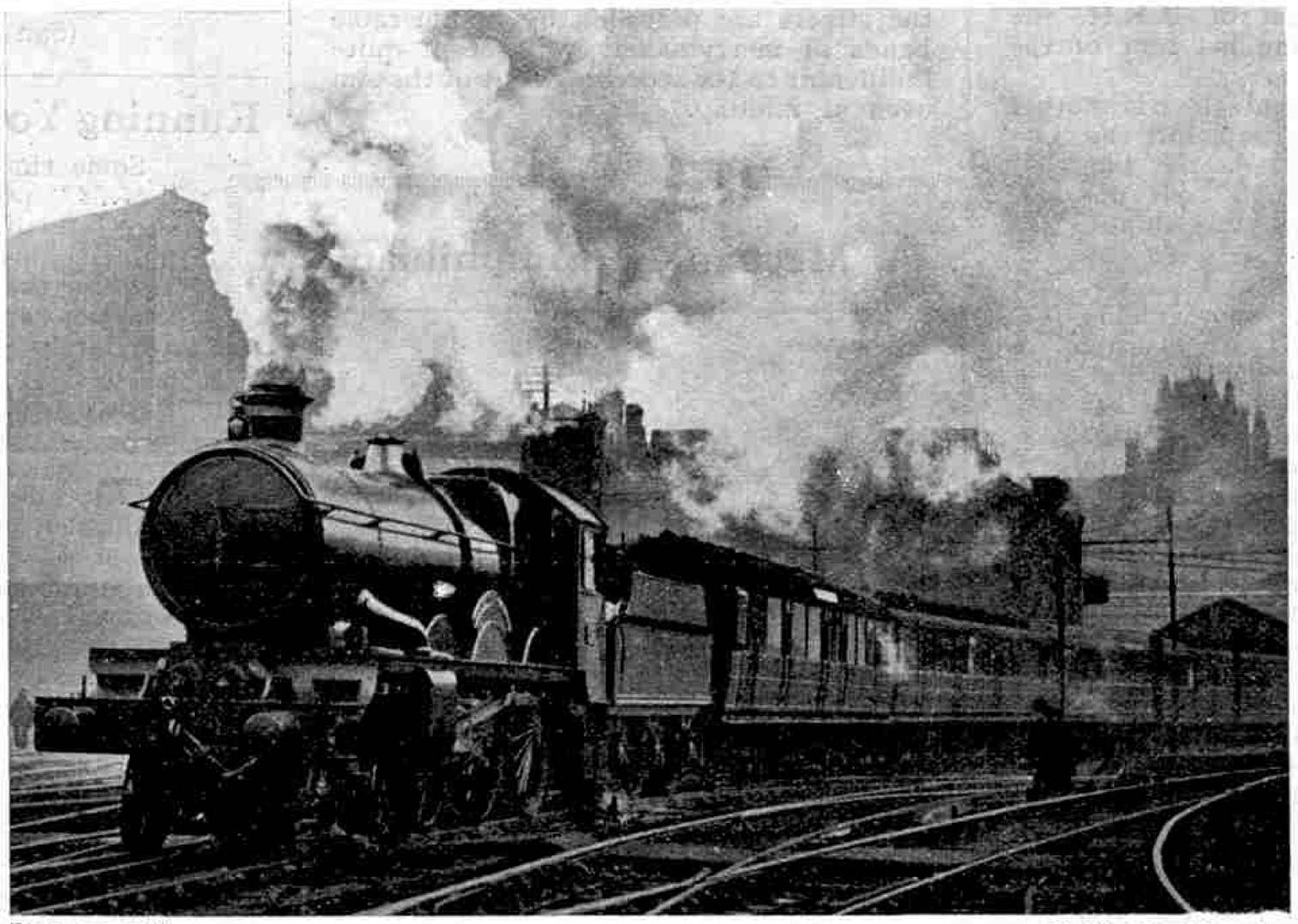


Photo courtesy] [*G.W. Rly. Magazine*

The G.W. loco "*Pendennis Castle*" leaving King's Cross with the L.N.E.R. train

To the general public the trials were simply a relative test of strength and speed between the rivals but to the engineer it was apparent that such magnificent machines would be capable of performing any task likely to be set them. For one thing, the value of the trials lay in the matter of relative coal and water consumption. As it was the business of the drivers to run to schedule times as closely as possible, there is in many quarters an erroneous idea that the result of the contest taken all round was a draw!

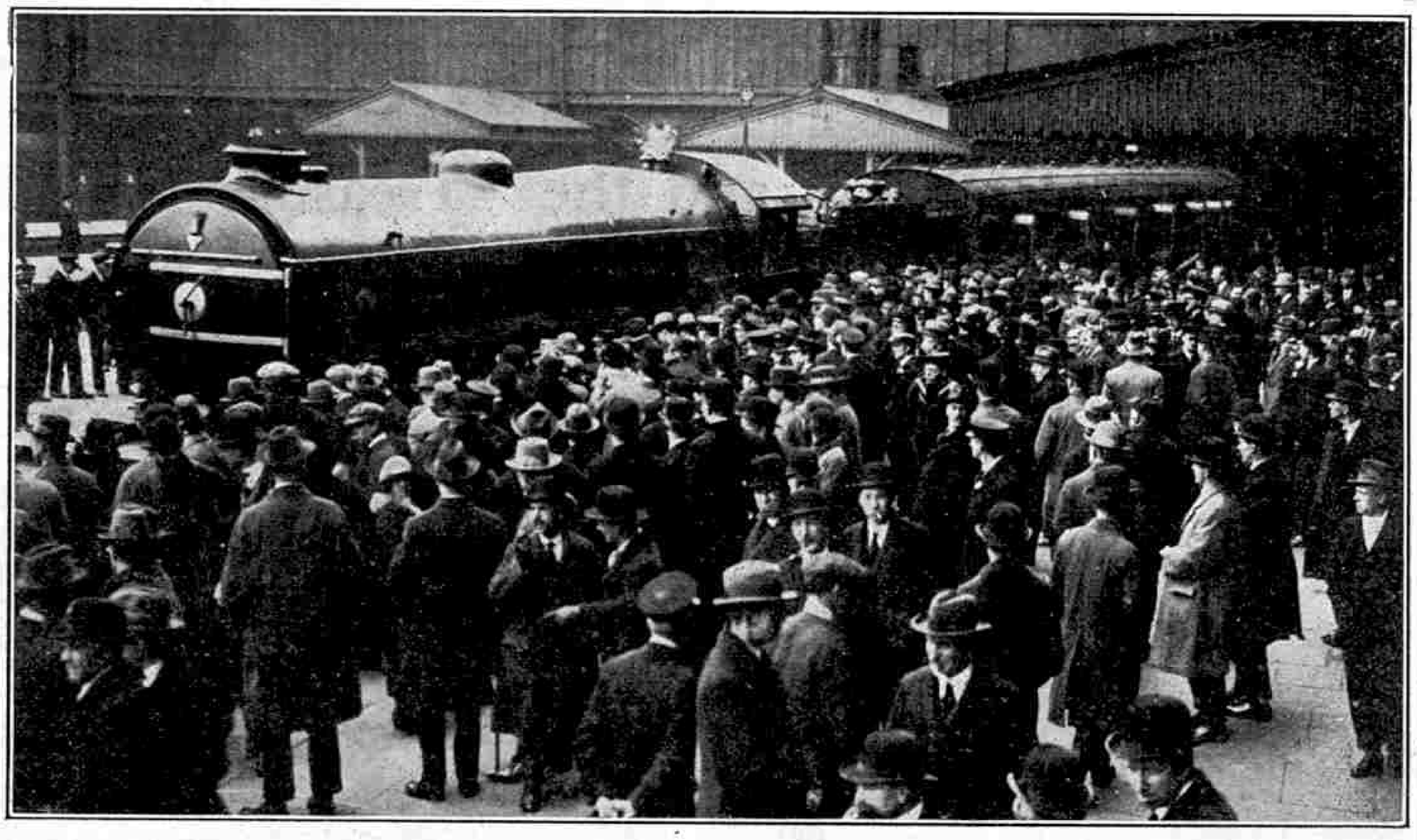
Early Breakdowns

Through the courtesy of the Great Western Railway we are able to give extracts from the detailed official notes made by expert observers who rode behind the respective engines undergoing trial. Unfortunately the corresponding official statements from L.N.E.R. headquarters are not yet available.

On the L.N.E.R. "*Pendennis Castle*" worked the following trains :—

	M.	Ch.	
10.10 a.m. King's Cross to Grantham 3.7 p.m. Grantham to King's Cross.	210	72	Mon., Wed., Fri., April 27, 29, and May 1.
1.30 p.m. King's Cross to Doncaster. 6.21 p.m. Doncaster to King's Cross.	311	74	Tues., Thurs., and Sat., April 28, 30, and May 2.

"*Pendennis Castle*" put up some very fine per-



The L.N.E.R. loco at Paddington before commencing its First Preliminary Run on the Great Western Railway

[Photo courtesy G.W.Rly. Magazine]

formances on the L.N.E.R. expresses and on the first day arrived at King's Cross 1 minute early. Unfortunately her Pacific rival broke down owing to an axle running hot, so the first day's test was not counted.

On the second day, despite delays totalling 10 mins. between Peterborough and King's Cross, the arrival was only 1 min. late, showing a clear 9 mins. made up by the loco. The L.N.E.R. contestant on this day was temporarily No. 2545, but on the down run her steam sanding apparatus failed and she lost 16¼ mins., while on the up journey King's Cross was reached 5¾ mins. late.

The Final Day's Run

On Wednesday, 29th April, No. 4475 resumed and on the down journey reached Doncaster 1 min. early, but on the return to London was 17½ mins. late owing to a 15½ mins. late start from Doncaster. A bad side wind affected the running of both locos, and "*Pendennis Castle*" gained only 1 minute on the down journey and on the up trip was 1½ mins. before time.

On Thursday both locos gained 1 min. on the up journey, and in the opposite direction the G.W.R. loco gained 1 minute and the L.N.E.R. loco lost 1¼ mins.

On Friday the Castle reached King's Cross 4 mins. early despite being 1 minute behind at Stoke Summit, while No. 4475 was in ¼ min. early after being 1½ mins. late at the same point.

The final day's running found "*Pendennis Castle*" at King's Cross 2½ mins. before time, while No. 4475, after being 4 mins. behind time starting from Grantham lost a further minute and was 5 mins. late at the terminus.

Splendid Running of the Rival Locos

The chief feature of the trial runs on the Great Western main line was the wonderful running of the "*Caldicott Castle.*" Despite a serious slack owing to bridge repairs which made both the G.W. and the L.N.E. engine late through Brent on all runs, No. 4074 arrived at Paddington on her three up journeys 14½ mins., 4 mins. and 7 mins. (after starting from Exeter 1 min. late) before booked time. On the down runs of the other three days, the arrivals at Plymouth were 5, 3, and 15 mins. early respectively. In the case of the last-mentioned trips, the average weight of the trains was 495 tons.

The L.N.E.R. Pacific No. 4474 also put up a splendid record. Her arrivals at Paddington on the up expresses were 1 min., 2 min. and ½ min. early and in the other direction two runs were strictly to schedule. On the remaining run Plymouth was reached ½ min. early.

It will thus be seen that on the L.N.E.R. the Castle was consistently better than the Pacific which was running against it on alternate days. On the G.W.R. the 4–6–2 loco did splendid work in regard to time-keeping and consistent running, which performance must not be minimised by the brilliance of the work of the "*Caldicott Castle.*"

Curves Cause Disadvantage to Giant Pacific

The L.N.E.R. engineers assert that their loco, of greater length and wheel base, was at a great disadvantage on the curve-infested line west of Plymouth, and had to gain time in hand on the long uphill sections.

Other interesting claims made in connection with the running of the rival locos may be briefly mentioned.

"*Pendennis Castle*" made a practice of negotiating the awkward start up the hill from King's Cross without fuss or slipping, and achieved really wonderful times out to Finsbury Park—records never excelled nor equalled by Great Northern-type Atlantics or Pacifics. On the last day of the test week, while travelling eastward the Pacific ran over Dainton Summit at a minimum speed of 31½ m.p.h. with 310 tons, establishing a record for the Great Western main line.

The Castles More Economical

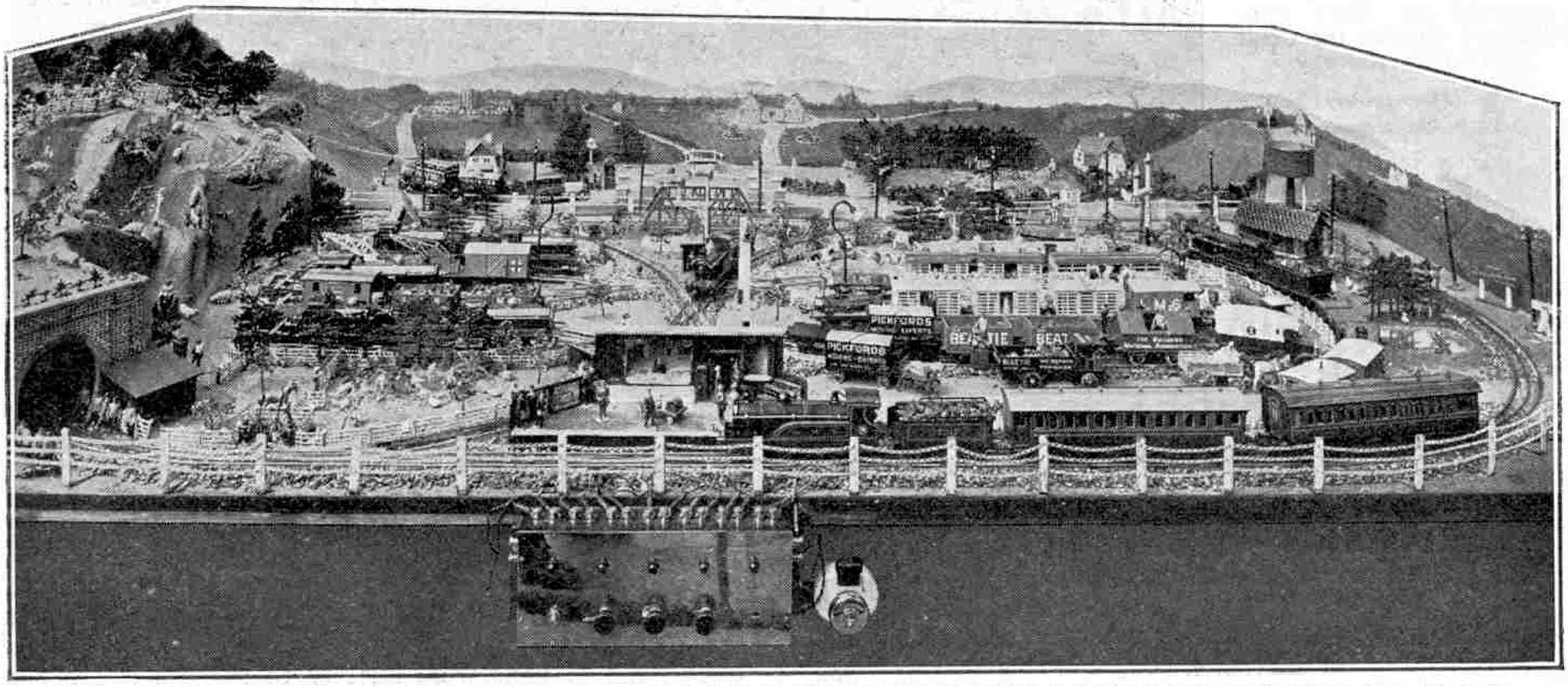
Taking into account the coal consumption, the results show that the G.W. design is more economical with both Welsh coal, as used on its own line, or the Yorkshire coal of the L.N.E.R. The average consumption of the G.W. loco for the trips on the G.W. line was 6 lb. of coal per mile less, and on the L.N.E.R. trips 3.7 lb. per mile less than that consumed by the corresponding L.N.E.R. loco.

(*Continued on page* 360)

New Wonders of Wembley

Model Railways and the "Treasure Island" Pirates

By a Meccano Boy



Messrs. Pickford's Ltd. fine display model, representing "Modern Transport," in which Hornby Trains and Accessories are used.

"MIND the train please!" Two gaudily-dressed pirates, one of whom had pronounced the warning, confronted me. I jumped perceptibly, I fear, for pirates are quite new to me. When they grinned, as they did when they saw me jump, however, their ferocious appearance lessened somewhat, possibly because they perceived that I had not attempted to evade paying my sixpence entrance fee! Feeling reassured therefore, I passed between them and entered Treasure Island—giving due heed to their warning, nevertheless.

I had heard of the miniature railway running round the island, and wondered whether the pirates were afraid that I might step upon it accidentally, unless they cautioned me. I soon saw, however, that there was no fear of that. I was standing at a "level-crossing," and just then there came into view "*Alice*"—a powerful little 0–4–4 Tank Loco.

Shades of the Buccaneers

Puffing and hissing with almost as much fuss as her grown-up sisters on our big railways make, "*Alice*" rattled past, pulling a load of twenty passengers as easily as a Hornby Loco hauls its train of Pullman cars. As I watched her disappear into the depths of the "Rockies," I determined to discover her terminus and have a ride in the train if possible. Glancing round, I noticed a sign

> "This way to Banff Station"

and crossing a bridge as directed, I was soon on Treasure Island proper. Here were more pirates, besides famous personages from all the best books. I looked eagerly for Long John Silver, Captain Hook, and the rest of Robert Louis Stevenson's immortal characters, and although I was unable to find them all, I feel sure they must have been there.

Anxious to obtain another glimpse of the railway, I passed round the miniature mountain—with its alluring caves and strange inhabitants—without waiting to discover if there really was any treasure buried there, and so regained the "mainland" by way of a little footbridge.

A Busy Spot

A real seaside scene stretches all round the "coast," opposite the island. The beach, consisting of the "Golden Sands from Mablethorpe," was covered with a small army of happy castle-builders, while here and there some tired but contented "Wemblers" were resting from their rapid travels round India, Hong-Kong, Canada, and all the other parts of our vast Empire.

As I carefully threaded my way along the beach and between innumerable sandy structures there arose from all sides the sounds of strenuous labour. *Thwack! plop!! thump!!!* came from a hundred spades, as one after another, castles and houses of all descriptions were miraculously beaten out of the sand.

Although every available inch of the beach was more or less occupied, everybody seemed quite happy. A deeply-engrossed castle-builder on my right stepped back to admire his handiwork, to the utter ruin, I am sorry to say, of his neighbour's gorgeous château of sand. A toiler a few paces away delivered such a resounding blow that his spade, rebounding, swept away the towers and battlements of yet another feudal Manor. True, there was a slight argument and a few loud cries, but everyone soon returned to the business of construction, only to repeat the whole cycle of operations. Surely Wembley's "Treasure Island" is a veritable children's paradise!

Through the "Rockies"

Having safely negotiated this wondrous beach, I arrived at the railway, which I now found to be the "Canadian Pacific." I forbore to enquire how Banff Station came to be situated on the C.P.R., or why a L.N.E.R. Atlantic tender engine constituted an important part of its locomotive rolling-stock. However, there it was, with all the appropriate scenery. Taking my place in the queue outside the station, I soon gained access to the platform, and had scarcely taken my seat in one of the coaches of the train before "*Alice*" started off on her circuitous route with a shriek of her tiny whistle.

It appeared to me that the railway was even more popular with the grown-ups than it was with the children, for the majority of the passengers were fathers and mothers who seemed to be taking a brief respite while the youngsters indulged in the far more serious and energetic work of delving in the Golden Sands! This is not surprising, for the "Treasure Island" railway is one of the finest examples of miniature engineering that I have ever seen, and I noticed more than one solemn City man deep in a discussion as to the rival merits of the two locomotives.

Past the engine-sheds and station

sidings we flew behind "*Alice*;" past the coaling yard, over level-crossings and through cuttings. As we rattled along, to the admiration of a large crowd of onlookers, I caught sight of the pirates' old wooden sailing-ship anchored off the island. Then quite suddenly we plunged through a tunnel in the heart of the Rocky Mountains, and on emerging found ourselves at the end of our amazing trip, for we were back at Banff Station!

A Fine Railway Exhibit

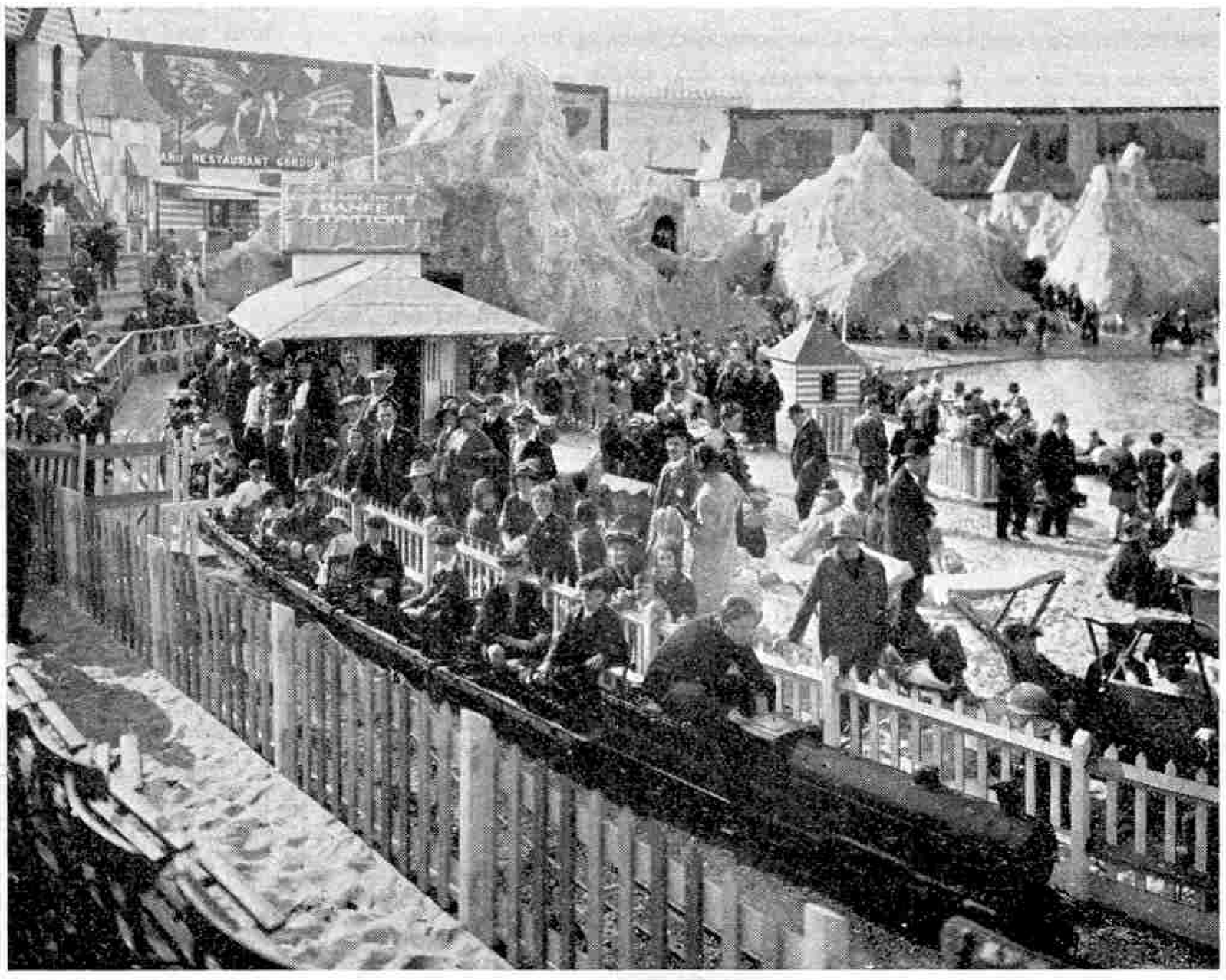
This experience reminded me that I had not yet seen the locomotives exhibited in the Palace of Housing and Transport, and reluctantly leaving Treasure Island, I directed my steps to that building.

It was with slightly downcast feelings, perhaps, that I once again entered the portals of what used to be the Palace of Engineering. How many Meccano boys (I wondered), would find the inspection of model houses, ideal homes, furniture, or the latest in luxurious cooking devices, as fascinating as studying turbines, motors, generators, radio apparatus, guns, armaments, and all the other wonderful engineering exhibits of last year. Once within, however, I soon found that there was a great deal to be seen in the Transport Section which occupied quite a large proportion of the available space.

A little crowd had collected round one of the exhibits. On making my way to this, I found the object of interest to be a realistic working model railway—a very elaborate affair. It included two stations, "up" and "down" main lines, and a complicated net-work of sidings. The whole was controlled by a perfect system of signalling, accurately modelled from present-day railway practice, and some very fine demonstrations were given at frequent intervals during the day.

All the signals, points, crossings, etc., were controlled from levers in miniature signal-boxes, and the trains, which were operated by electricity, moved quite slowly so that it was possible to follow every detail in the signalling while they were in motion. I spent some considerable time at the exhibit, and could not help noticing the large amount of skill necessary to control correctly this model railway; it certainly gives one a very good impression of the tremendous amount of work and ingenuity that must be called into play before a train can traverse even a mile of track.

Whenever I travel by rail, I am now able to imagine the hundred-and-one devices that are in constant operation just ahead, as the telegraph flashes the movements of our train from signal-box to signal-box. Only the precision and accuracy of the apparatus enables us to travel for mile after mile at tremendous speed and with perfect safety.



"*Peter Pan*," the Atlantic loco of the Treasure Island Railway, with a load of happy young "Wemblers."

Two famous locos, which must be familiar—if only by name—to every Meccano boy, are included amongst the railway exhibits. They are the "*Flying Scotsman*" and the "*Pendennis Castle*" belonging, of course, to the London & North Eastern and Great Western Railways respectively. These two locos commanded no little attention from the sight-seers, in view of the fame that they achieved during the recent locomotive trials, as described in last month's "*M.M.*" [See also page 350 of this issue—EDITOR.]

The rival locos are in spotless condition, and certainly do not show any sign of the exhausting tests to which they have been subjected. The "*Scotsman*" is jacked an inch or so from the rails so that the wheels may be rotated by means of an electric motor placed beneath the loco. As I watched the 6 ft. 8 in. driving wheels slowly revolving with their massive connecting links and piston rods, a sense of extraordinary power seemed to radiate from this superb piece of machinery. Standing alongside the iron giant, one feels quite dwarfed, for a much better idea of its size is obtained from this position than from the more usual viewpoint of a raised platform.

The L.M.S. Railway's exhibit includes one of that Company's latest "Baltic" tank locos, which type of loco was described in the April issue of the "*M.M.*" On the Southern Railway's stand I saw one of their "810" class 2–6–0 tender engines, together with a very fine Pullman car.

Veteran Locos to Arrive Shortly

Amongst some famous old railway relics that I found were the 0–4–0 Bury tender engine, "*Copper Nob*"—so named from its dome-like firebox top; the Canterbury and Whitstable Railway's loco "Invicta," and several examples of early permanent way, signals, etc.

A splendid 1,200 horse-power electric loco is exhibited by the Metropolitan Railway and the close-up view of this latest type of locomotive enables the interior arrangements to be easily examined, for the panels on one side have been completely removed.

Hornby Trains at Wembley

I learnt, by the way, that on the conclusion of the Railway Centenary celebrations at Darlington, which are taking place on the 2nd and 3rd July, some of the "relics" will be brought down to Wembley to complete the Centenary exhibit there. Amongst the locos to be transferred are Stephenson's "*Locomotion No. 1*" and, I believe, Hedley's "*Puffing Billy*."

Included in the Transport Section, and situated not far from the "*Flying Scotsman*," is a very interesting stand belonging to Messrs. Pickfords Ltd., the well-known carriers. A special display, which takes the form of a splendid model of present-day methods of transport, is of special interest, in view of the fact that Hornby Trains and Accessories have been used to a considerable extent in its construction.

No less than five No. 1 and three No. 2 Hornby locos are used in addition to wagons, trucks, a Hornby Viaduct and Water Tank, and numerous other accessories. Amongst the various methods of conveyance represented, in addition to railways, is a realistic little model of one of Messrs. Pickford's heavy motor lorries, complete with trailer, as well as one of their horse-drawn vehicles; also a steam traction-engine and a very smart limousine.

Bird's-Nest Soup, Crocodiles, and Frogs

Needless to say, I spent many hours in all the other parts of this great Empire Exhibition. There were a number of additions and improvements over last year, and it seemed that every pavilion and kiosk, every country or firm exhibiting, had exerted their utmost efforts to better or eclipse their display of 1924. The Indian, Canadian, and Australian buildings I can only describe as gorgeous;

(*Continued on page 363*)

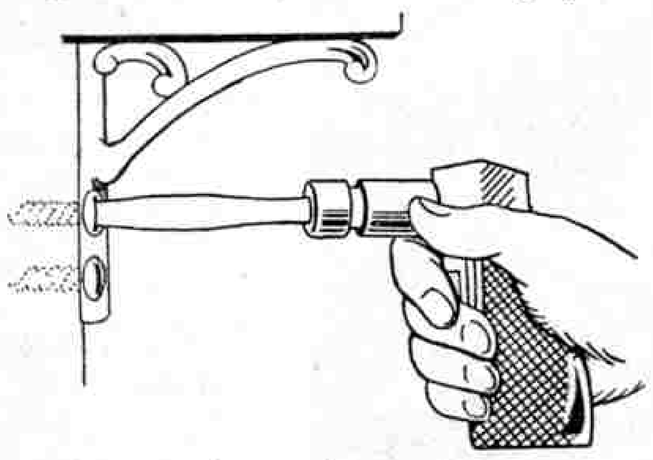
OUR BUSY INVENTORS

RECENT INTERESTING PATENTS

Every day new inventions and ingenious labour-saving devices are being brought into existence. From time to time the most interesting of these will be described and illustrated in these columns. Readers are invited to send particulars (accompanied if possible with photos, sketches, or cuttings) of any interesting inventions or devices that may come to their notice. Payment at our usual rates will be made for any contributions used.

Screwdriver "Pistol"

The great advantage of the screwdriver illustrated below is that the pistol-shaped butt permits a very much firmer grip than



the ordinary form of handle. In consequence, even the most obstinate screws may be driven into place with ease. Different-sized blades may also be fitted into the butt as desired.

Power from the Wind

A machine called the "Aerodynamo" has recently been invented in Germany for developing power from the wind. If the tests now being carried out prove satisfactory, it will be possible to use electricity in many places where there is at present no other power supply. The machine is really a dynamo mounted on a concrete mast and wind-driven by means of a four-bladed propeller geared directly to it. The current generated by the dynamo is led to a storage battery for use when there is little or no wind. The generator and gearing are enclosed in a stream-lined hood, to protect them from the weather.

From tip to tip, the propeller measures 28 ft. and is designed to run at a normal speed of 1,200 r.p.m. The blades of the propeller are fitted with an ingenious arrangement of brakes by means of which the speed of the propeller is controlled. At normal speeds these lie flat against the blades but should too high a speed be obtained, they are flung out by centrifugal force so that they offer a direct resistance to the wind. The propeller is thus prevented from revolving at an excessive speed. Another brake is provided on the propeller shaft to enable the machine to be stopped altogether if necessary.

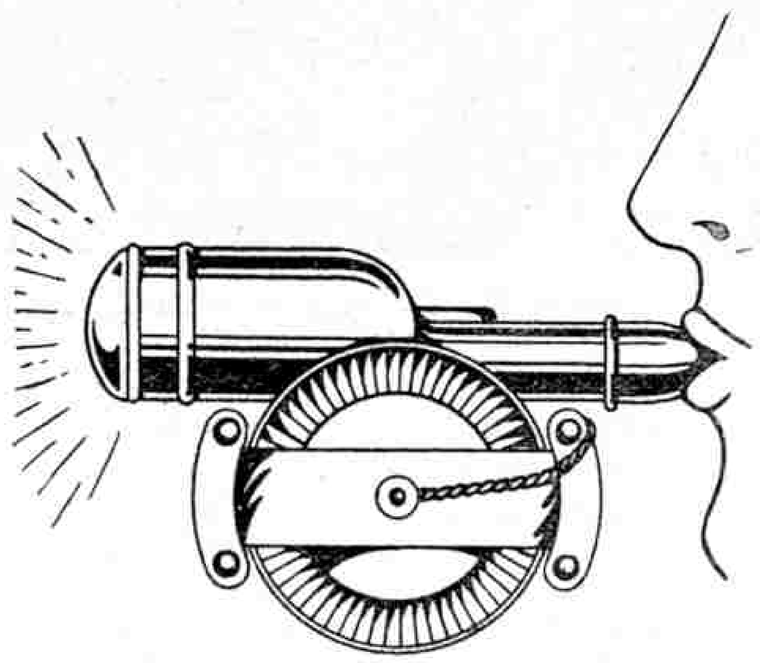
Radio Types from Plane

Experts of the Navy Department, experimenting at Anacostia Naval Air Station, Washington, D.C. recently succeeded in transmitting by radio, typewriting from an aeroplane in the clouds. The aeroplane typewriter controlled the keyboard of a receiver on the ground many miles distant and the typewritten characters were repeated as the keys were struck in the clouds.

The instrument, known as the teletype, consists of transmitting and receiving apparatus. The sending typewriter is mounted on a standard type of navy plane and in general appearance resembles the commercial typewriter. It is equipped with key-board, letters, and other conventional symbols and is operated by hand. There is little to distinguish it from an ordinary typewriter except that every key is connected to the radio transmitter, with which the ground receiver is tuned, wherein lies the secret of the whole apparatus.

Novel Lamp for Cyclists

A French inventor has recently introduced a novel electric lamp for cyclists. This is worked by blowing, the lamp being



carried in the mouth when in use. The *Lampe à Bouche*, as it is appropriately called, comprises a tiny turbo-generator that is made to revolve at 3,000 r.p.m. by blowing into the mouth-piece. The lamp gives a good light at 2.5 volts with only .05 amperes. It is provided with a special tungsten-thorium filament, the amazing fineness of which may be gathered from the fact that a yard of it only weighs $1\frac{1}{2}$ milligrammes. The tiny turbo-generator runs so easily that after blowing into it the turbine will continue to revolve for a full minute, in spite of the braking effect caused by the production of current.

The one disadvantage about this unique lamp seems to be the blowing part, as most cyclists find they require all their breath for pedalling! The makers distinctly state, however, that the exercise has a very beneficial effect upon the lungs!

Mechanical Guide to London

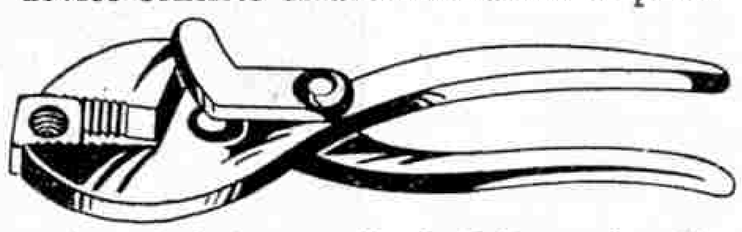
An electrically-illuminated guide to London, similar to one now in use in Los Angeles, California, is to be erected as an experiment, in the tramway shelter near Waterloo Bridge. All that is necessary to find one's destination is to turn an indicator to the name of the place required and press a button, when the place is shown by means of illumination on the map, together with the nearest route to it. The number of the appropriate tram route will also be shown.

On pressing a button, an alternative machine of the same type will illuminate several alternative routes to one's destination, and will thus show the various means of getting there.

Instead of having a pointer and one button the machine in Los Angeles has a different button for each place, the names of which are arranged in alphabetical order in columns down each side of the map.

Automatic Pliers

A wrench recently invented automatically locks its grip after securing a hold. The device consists of a combination of pliers



and a ratchet arm attached to one handle that engages the lower side of the opposing jaw. To free the mechanism, the clamping device is pushed aside and the jaw is able to adjust itself to any "nip" within the range of the tool.

Sanitary Cover for Telephone Earpieces

Considering the number of different people who use public telephone boxes each day, it is not surprising that the ear and mouthpieces often carry infection, and with this fact in mind a sanitary cover for the earpieces has been invented. This is made of strong paraffined paper, crimped and pressed into the form of a cup so as to fit easily over the end of the earpiece. As the covers can be produced at almost negligible cost the idea would be to have a supply in each telephone box so that every subscriber could use one and then throw it away.

Cushion Grip for Motor Cyclists

A new cushion grip for motor cyclists and cyclists has just been put on the market. The grip is extremely useful, and handsome in appearance, the ends being of celluloid and the centre of rubber, grooved and shaped to give a comfortable grip. The foundation is coated inside with a special substance which only requires to be moistened and then slipped on to the handlebar to make a firm joint.

The grip is made in two sizes—for 1″ and $\frac{7}{8}$″ handlebars and a cyclists' model is 1″ shorter than that made for motor cyclists.

Automatic Burglar Alarm for Motor Cars

A device has recently been patented to give instant warning should the car be touched when the owner is not there. This is accomplished by means of a wheel being released by the slightest jar on the car, notches in it making an electric contact as it revolves, thus causing a series of blasts on the horn. The driver has merely to set a switch before leaving the car, and as the position of it need be known only to him, it cannot be put out of order without first touching the car.

The device may also be fitted to doorways and windows and in fact to almost anything that requires to be guarded from burglars, provided of course, that an electric current is at hand to work it.

THE ITALIAN NAVY

Three New Flotilla Leaders

THREE new flotilla leaders have been completed during the past few months for the Italian Navy. They are the "*Lion*," "*Tiger*," and "*Panther*," and these three ships, which mark an important development in naval ship-building, recently visited Liverpool. While the crews were entertained by the City authorities, visitors were allowed on board, and no doubt many of our readers who are fortunate enough to live in the district, took advantage of this opportunity to inspect the vessels. Tens of thousands of people inspected the boats during the three days they were on view.

The "Swift's" Record of 36 Knots

The new scouts are interesting because for some years past the leading navies of the world have been paying marked attention to the development of this type of vessel. This is known as the "Flotilla Leader," and these three new Italian scouts show the latest vessels of this type.

One of the first flotilla leaders was H.M.S. "*Swift*," laid down nearly 20 years ago. She was 345 ft. in length and had a displacement of 1,800 tons. Fitted with quadruple turbine engines, her speed was 36 knots. She was a famous boat in her time and became the object of considerable attention when she broke H.M.S. "*Tartar's*" record. H.M.S. "*Tartar*" built by Messrs. John I. Thornycroft and launched in 1907, broke all records by travelling at 35.67 knots, but this was subsequently beaten by H.M.S. "*Swift*" which put up a speed of 36 knots.

The flotilla leader type of boat is simply a large type of the destroyer. In later years, so far as our navy is concerned, the size of the original boats has been reduced for reasons of economy.

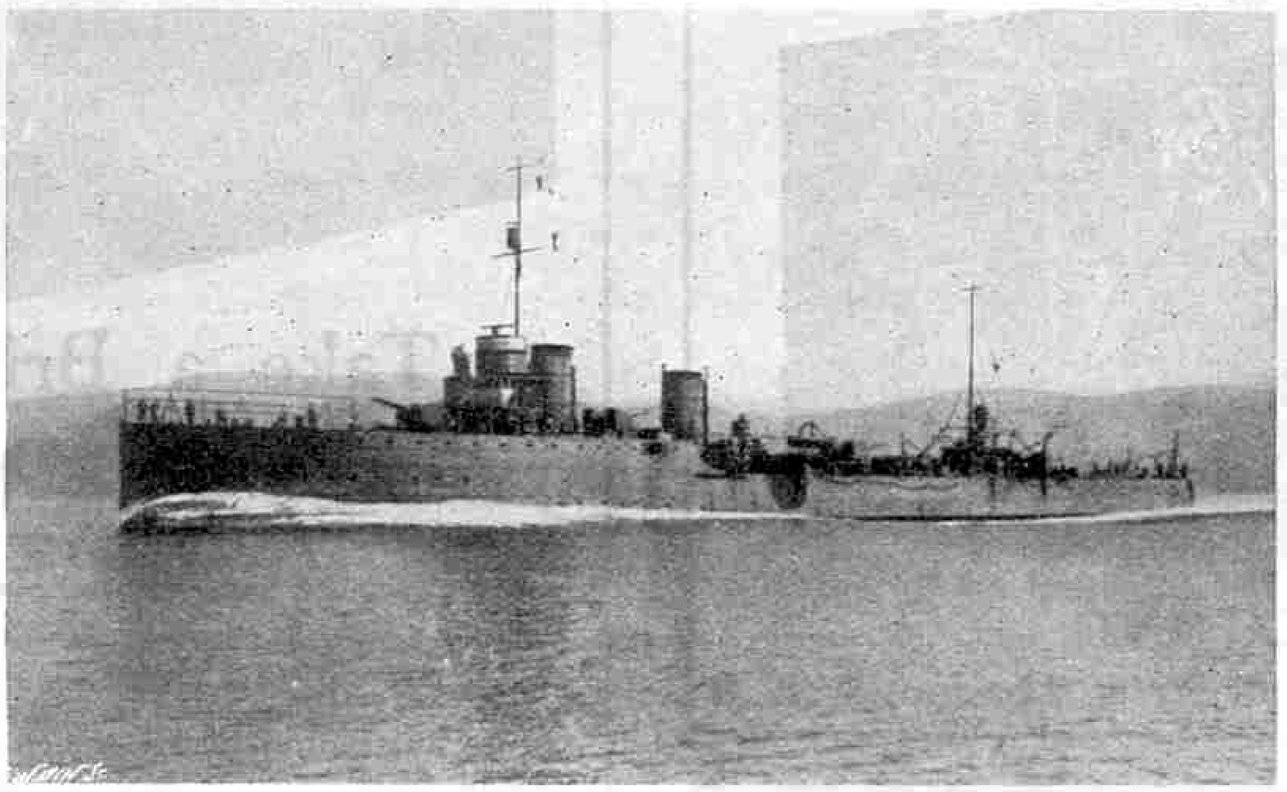


Photo courtesy] ["*The Engineer*"

The "Lion"

The French "Jaguar"

During the war Germany built a number of 2,300 ton boats of this type. They had a very high speed and were armed with four 5.9 in. guns. After the Armistice one of these vessels was allotted to France and it served as a model for the latest French flotilla leaders of the "Jaguar" class, which have been built on similar lines. They are a shade heavier, however, being of 2,359 tons and their speed is just over 35 knots and armament five 5.1 in. guns.

Four Turbines for New Scouts

Several fine boats have recently been built on the same lines for the Italian Navy, and the three now being dealt with are part of an order for five, two of which, the "*Leopard*" and "*Lynx*" are not being proceeded with.

The "*Lion*," "*Tiger*" and "*Panther*" were built by Messrs. Gio. Ansaldo & Co., of Sestri Ponente. They are 359 ft. 6 in. in length, 33 ft. 6 in. in breadth, and 11 ft. 6 in. draught, and the normal displacement of each is 2,165 tons.

Each vessel is fitted with four sets of Parsons turbines, geared down and operating twin-screws. Steam is supplied by four Yarrow boilers burning oil fuel, for 400 tons of which carrying capacity is provided, although 200 tons is a normal supply. The boats have a straight stem and the forecastle deck is carried well aft.

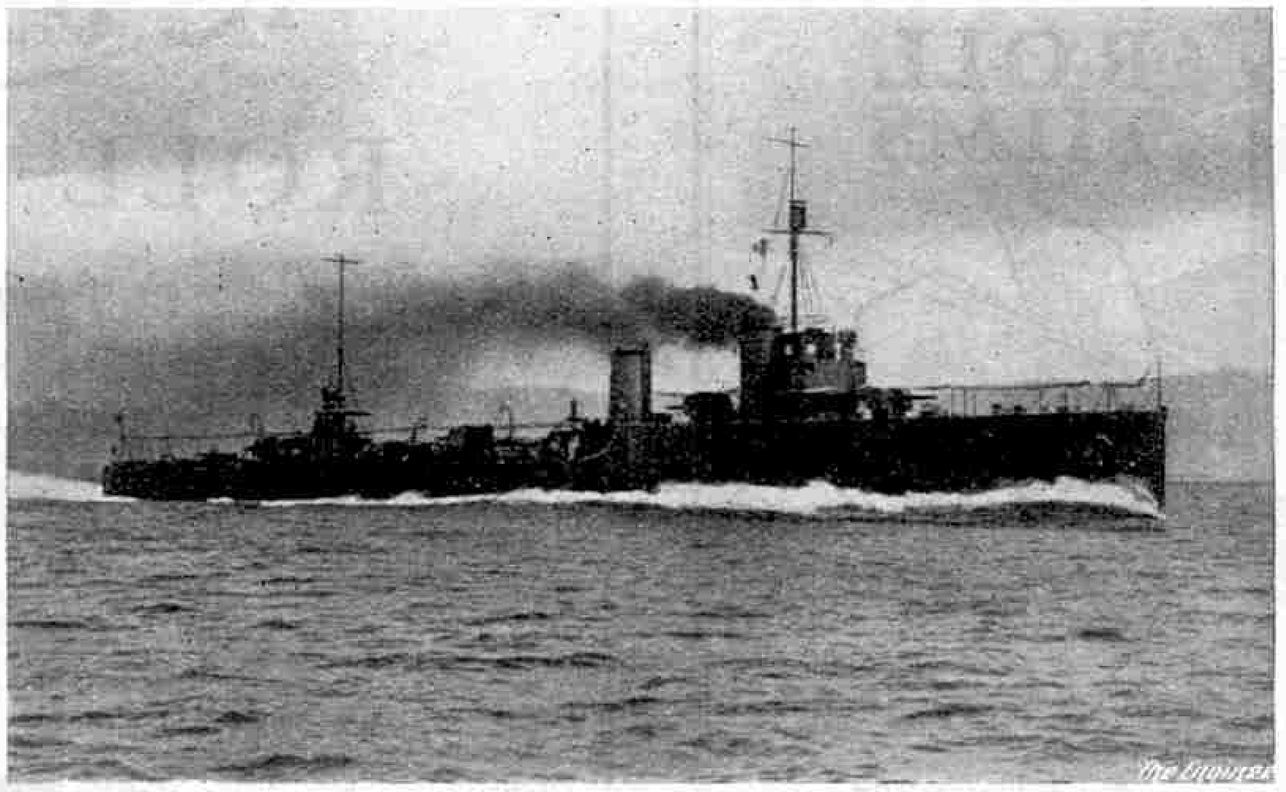


Photo courtesy] ["*The Engineer*"

The "Tiger"

The Armament of the Vessels

All the boats of the Italian Navy have very powerful armament in comparison with their displacements, and this practice is carried out in the case of the new

(*Continued on page* 361)

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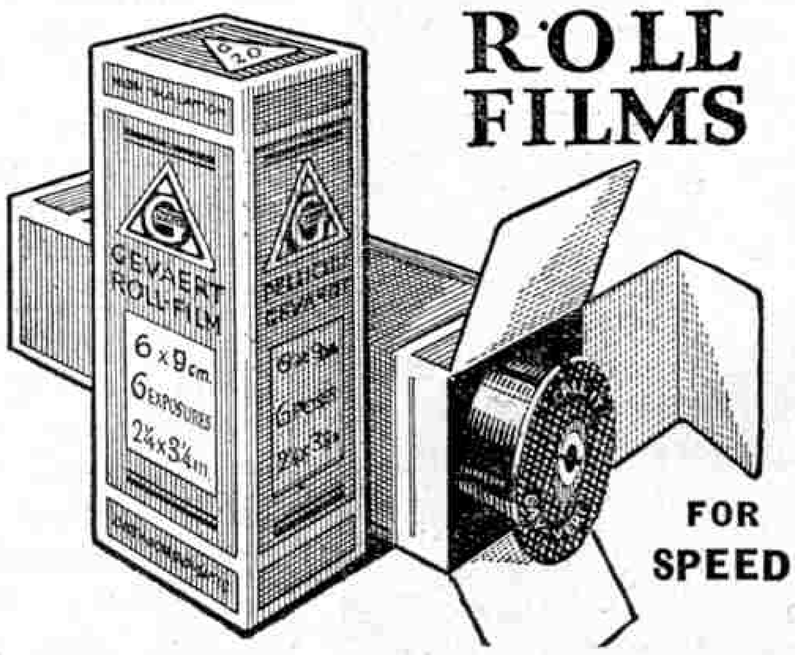

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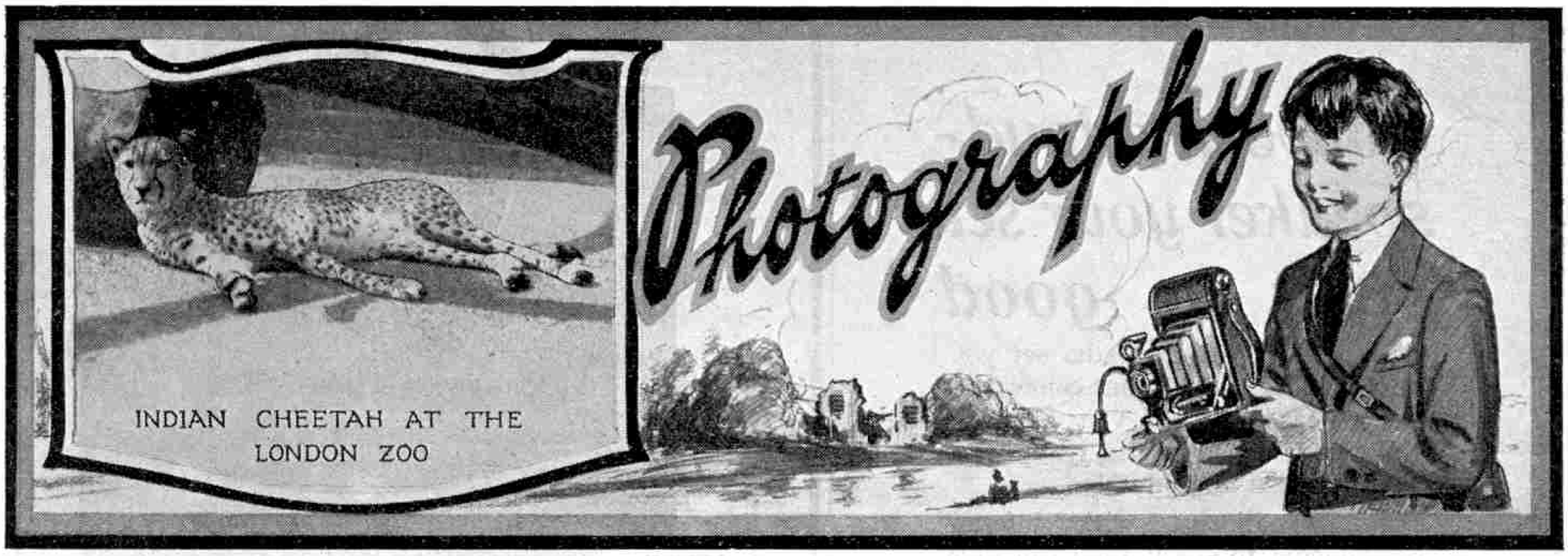


IV. TAKING THE PHOTOGRAPH

LAST month we dealt with four important points to be considered in calculating the correct exposure of a photograph, namely, the strength of the light, the aperture of the lens, the speed of the plate or film and the nature of the subject to be photographed. We now come to the fifth and last point, the movement (if any) of the subject.

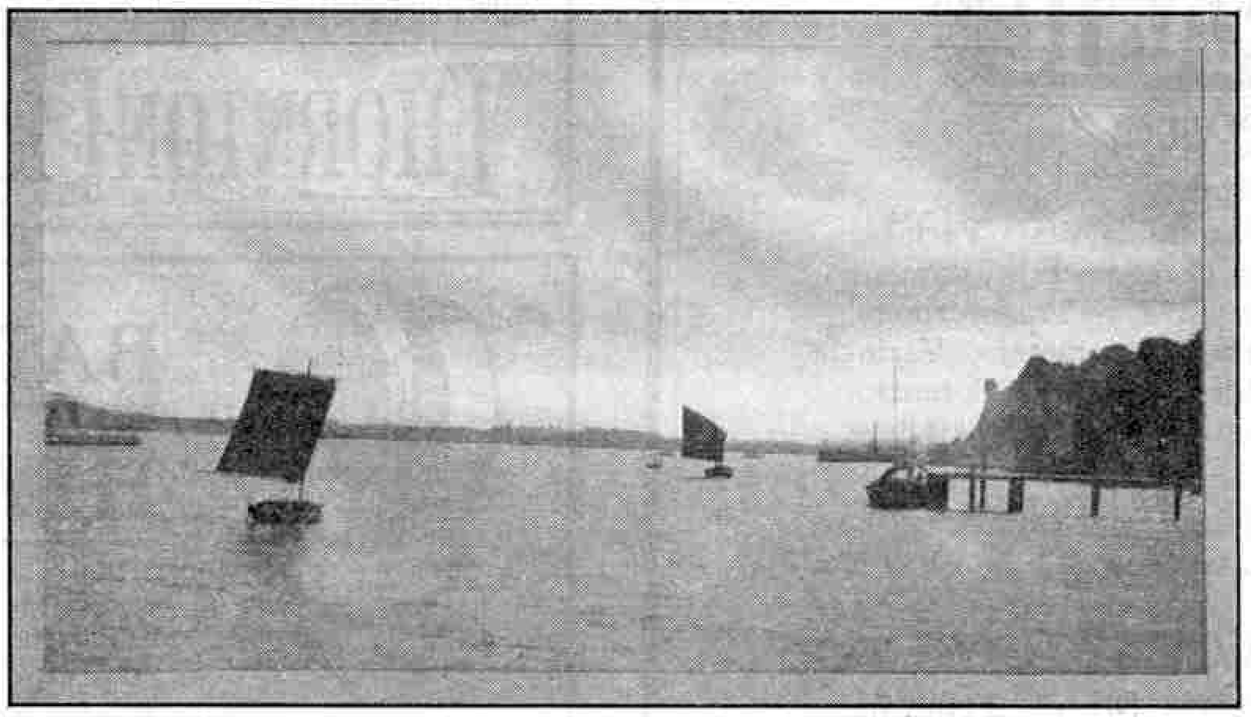
Exposures for Moving Objects

In photographing any moving object it is clear that the exposure must be brief enough to outline the movement sharply and avoid a blurred result. The permissible exposure, of course, varies greatly according to the speed of movement. For instance, an ordinary street group in which there is no rapid motion of any kind can be sharply snapped with an exposure as long as 1/5th of a second, whereas in order to snap a man diving from a pier into the sea we might have to cut down the exposure to 1/600 sec., and even this brief period would be too long for a successful snapshot of a galloping horse at close quarters!

The beginner is strongly advised to experiment at first with ordinary views containing no moving objects at all, and certainly not to attempt anything beyond a snap of people or animals moving at a slow walking pace. The shutters fitted to the cheaper kinds of cameras are never marked to give a shorter exposure than 1/100 sec., and as a matter of fact this 1/100 is usually considerably nearer 1/25. In order to take a snapshot of a man walking at the rate of four miles an hour, and moving obliquely towards or away from the camera, an exposure of at least 1/100 sec. is required when using a ¼-plate camera at a distance of 25 ft. From this example it will be seen that the amount of photography of moving objects at close quarters that can be done with a cheap camera is very limited indeed.

With better-class cameras having faster shutters the scope is enormously increased, and we shall deal in a later article with the intensely interesting problem of photographing such rapidly-moving objects as motor cars, trains or aeroplanes.

In the meantime we may add that, if the exposure for a certain moving object is 1/100 sec. with a camera 25 ft. away, a similar result may be obtained by moving the camera 50 ft. away and giving 1/50 sec. In this manner, even with a comparatively slow shutter, quite good snapshots of moving objects may be obtained. Of course the resulting photographs will be very small, but they should be sufficiently sharp to allow of considerable enlargement.



Chan S. Fong, of Singapore, sent us this snap for the Tenth Photo Contest. It was awarded Second Prize (Section B).

Taking the Photograph

We now come to the actual taking of the photograph, and having decided on our subject, the first matter to be considered is focussing. If the camera is of the ordinary box form type fitted with a single lens working at F.11 it will not be provided with any means of focussing. Such instruments are known as "fixed focus" cameras, and although they are perfectly successful for landscapes, they cannot be used for near objects unless what is known as a "portrait attachment" is placed in front of the lens, thus bringing objects a few feet away into sharp focus.

Using a fixed focus camera of ¼-plate size fitted with a lens of about 5 in. focus, objects 15 ft. or more away may be regarded as being in reasonably sharp focus.

Methods of Focussing

Most folding cameras, however, are fitted with a "focussing scale." This is a scale marked off in distances, feet or yards, and fixed at one side of the camera base below the lens. The front of the camera in which the lens is fixed may be moved in or out by means of a rack and pinion, and when it is desired to focus upon any particular distance the controlling screw is turned until a small pointer attached to the camera front is exactly over the figure indicating the desired number of feet or yards.

There is also another type of camera in which the body of the instrument is fixed and focussing is carried out by revolving the lens, thereby causing it to travel in or out as required. The various distances are marked off on the lens mount and when any particular figure is brought opposite a certain fixed mark the camera is then focussed sharply for that distance.

Judging Distances

It is obvious that in using either of the two foregoing types of camera the distance of the object to be photographed must be known with fair accuracy. Whenever possible this distance should be measured by pacing it out. This is not always possible, however, and therefore every opportunity should be taken of practising judging distances. This practice may be made an interesting and amusing pastime if carried out by one or two friends during a long walk, and it will be found curious how greatly people's estimates of distance vary!

Folding cameras may also be focussed by means of a ground glass screen which is placed in the position of the plate. The image of the subject as it will appear on the plate is then seen and may be sharply focussed. In order to see an image on a ground glass screen clearly, it is necessary to have some kind of shade to cut off unwanted light. With hand cameras this shade is generally provided by a short

(*Continued on page* 359)

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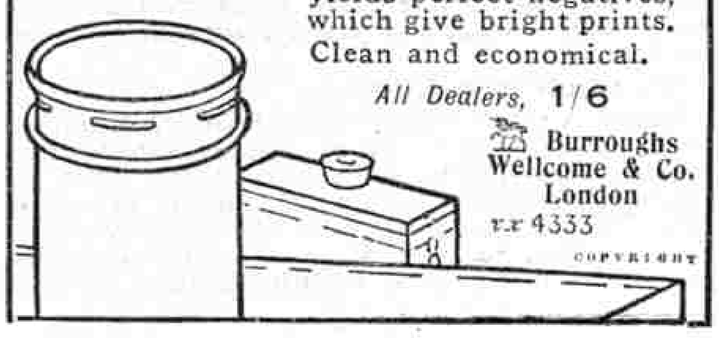

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Photography—(*cont. from page* 357)

folding hood which, when opened, projects from the back of the camera.

In addition to the cameras we have mentioned there is also the "reflex" type, but this will be considered separately in a later article.

View Finders

In ordinary box or folding hand cameras the view that will appear on the plate or film is seen by means of a "view finder." The most common type of finder consists of a tiny lens which throws on to a mirror a miniature reproduction of the view. This type of finder is not absolutelyaccurate,and if a certain object which it is desired to include in the photograph is seen to come quite close up to the edge of the finder image, it is not safe to assume that this will appear as desired on the plate. In other words, it is wise to allow for a small margin of error between the finder and the view that will appear on the plate or film. In order to use this type of finder the camera has to be held at approximately waist level.

Another common finder is the "direct vision" type. This is fixed in the centre of the top of the camera and consists of a small lens, proportionate in size to the plate, with a small eyepiece in front of it. By holding the camera at eye-level and looking through the eyepiece the view to be photographed is seen.

In making the exposure it is essential that the camera should be held perfectly steady. To the average person this is almost an impossibility for more than about 1/15 second, and for longer exposures it is necessary to use a tripod or to place the camera on a wall or other firm object. Another important point is to press the trigger gently and steadily until the shutter is released, thus avoiding any jerking of the camera. Many beginners are inclined to press the trigger of the shutter very rapidly, apparently with the idea of increasing the speed of the shutter, but this idea is, of course, erroneous. The speed at which the trigger is moved has no effect whatever upon the speed of the shutter.

Loading the Camera

If roll films are used the camera may be loaded and unloaded in daylight, and the advantages of this are obvious. It should be remembered, however, that although these cameras are "daylight loading," it is not advisable to carry out the process in direct sunlight. A shady place should be chosen for the purpose, or at least the camera should be screened by the body.

The actual method of loading the camera varies with different makes, but the booklet given with each camera gives full instructions for this operation. Care should be taken not to unwind the film wrapping further than is necessary to get a good grip on the winding spool, otherwise there is a danger of exposing some of the film itself before the back of the camera is in position. The film also must not be allowed to become slack on the spool or light may creep in at the edges. Still another point is that the film must be fitted into the camera absolutely straight, for if this is not done the edge of the film binds on the rim of the spool, causing the film to crumple badly at the edge.

One other piece of advice must be given at this stage—always change your plate or film immediately the photograph has been taken. If this is not done at once there is always a great danger that it will be forgotten entirely, with the result that the photographer has the extremely aggravating experience of taking two photographs on the same plate or film!

Where the Fruit Grows

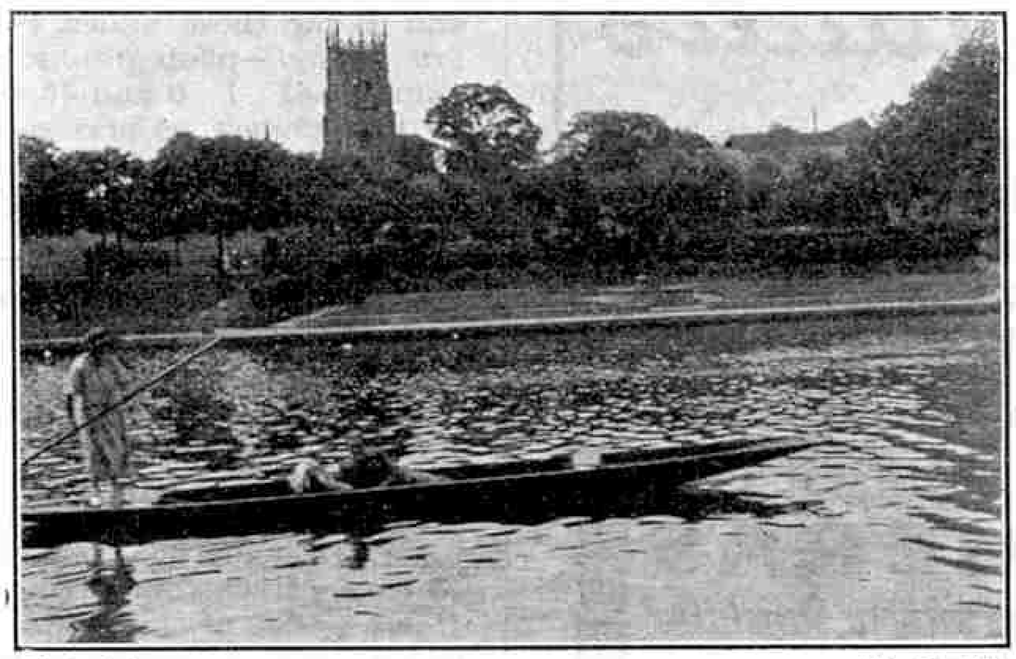


Photo by] [*B. Bentley*

A reader's snap of a River Scene at Evesham, Warwickshire

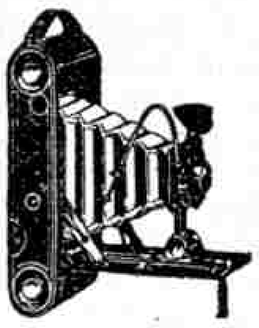
Seventeenth Photo Contest

At this time of the year we are all suffering more or less from "holiday fever," and are thinking of the happy times we hope to have before long at the seaside, in the country or elsewhere. Happiness and holidays must go together, for unless a holiday is really happy it is a dismal failure. At the same time we all have different ideas of holiday happiness and what is a delight to one may be dull and uninteresting to another. However, it is always a pleasure to see others enjoy themselves in their own particular way.

The majority of our readers will be scattered far and wide before very long and we want them to capture, by means of their cameras, some particularly happy incident of their holidays, and entər these photographs for our Seventeenth Photo Contest, the subject of which is: "A HAPPY HOLIDAY SCENE."

In judging the entries for this contest we shall pay regard first and foremost to the competitor's success or otherwise in giving us a picture of holiday happiness. The competitor who succeeds in doing this, even though his photograph may be technically poor, will stand a better chance than one who sends in a technically perfect photograph but fails to depict happiness. In short, the prize-winning photographs will be just those of the kind that we turn to again and again during the long winter months, and which give us

(*Continued on page* 360)



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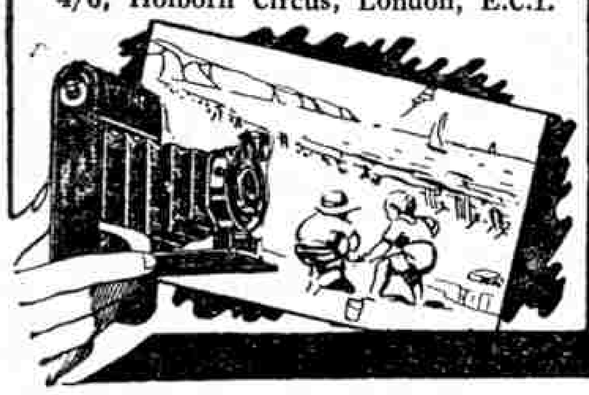

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PATENTED.

Seventeenth Photo Contest—

(*Continued from page* 359)

keen pleasure as our minds flash back to the day on which the snap was taken.

Prints may be of any size and made by any process and the work may be done by the competitor himself or by a photographic dealer. In the event of a tie for a prize preference will be given to prints that have been made by the competitor himself, and therefore every entrant must state on the back of his print by whom it has been made. In addition each print submitted must bear the name, address and age of the competitor clearly written.

The competition will be divided into two sections—A for competitors of 16 and over and B for those under 16. Four prizes are offered—photographic goods to the value of £1 1 0 and 10/6, to be chosen by the winners, as first and second prizes respectively in each section.

Closing date 31st July (Overseas, 30th November).

Extra Prizes

We are glad to be able to announce that Messrs. Gevaert Ltd., are repeating this month their offer of additional prizes. As was the case last month, Messrs. Gevaert Ltd. offer an additional prize of photographic goods to the value of 5/-, to be selected from their list of products, to each of the four prize winners in the *Home Section* of this contest, on condition either that *the negatives have been made on Gevaert Roll Films or Gevaert Plates* or that *the prints have been made on one of the Gevaert papers.* Competitors who wish to try for these additional prizes must send in with their entry the label from the packet of Gevaert Films, Plates or Papers used by them, and also the name and address of the dealer from whom the material was obtained.

This month we are pleased to be able to announce a further generous offer. Messrs. Amalgamated Photographic Manufacturers Ltd., whose advertisements in the "*M.M.*" are now familiar to our readers, offer the handsome prize of one of their "Altrex" folding film cameras, value £2/10/-, for the best entry submitted in the Home Section of this competition, on condition that the negative was taken on Rajar Roll Film and the print made on Paget Self-Toning Paper. It will thus be seen that this camera may be won by a competitor in either class A or class B. Competitors who intend to try for this camera must state their intention at the time of sending in their entry, and must enclose the carton in which the film was supplied and the envelope in which the paper was packed, together with the name and address of the dealer from whom the material was obtained.

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Results of Fourteenth Photo Contest

There was a very large entry for this competition and generally speaking the standard of work was excellent. It proved no easy matter to sift the photographs and decide on the four prize-winners. An interesting feature of the contest was that many of the finest efforts were produced by small and inexpensive box and folding cameras, and in one case a nature study snapshot taken with a home-made camera brought a young reader close to the winning-post.

The awards are as follows:—

Section A (14 and over)—First Prize (photographic goods value £1/1/-), D. F. Mackay (Stockport); Second Prize (photo goods value 10/6), Edith A. Sloane (Liverpool). Section B (under 14)—First Prize (Photographic goods value £1/1/-), Denis F. E. Nash, (Sutton, Surrey); Second Prize (Photographic goods value 10/6), George Nicholl (Farnham, Surrey).

Useful Cameras

Messrs. Amalgamated Photographic Manufacturers Ltd. (Soho Sq., London, W.1.), have sent us a well-illustrated catalogue of their cameras and photo materials. A good example of value is provided by the "APEM" box camera for roll films sold at the remarkably low price of 13/6, which will be found a very useful instrument for the beginner. Among folding film cameras the "Altrex" calls for particular notice on account of its sound value and also because it is the instrument offered by the makers as an additional prize in our Seventeenth Photo Contest announced this month. The "Altrex" takes pictures 2¼ in. by 3¼ in., and its capacity is six exposures without reloading. The shutter gives speeds of 1/25, 1/50 and 1/100 sec., and at the price of £2/10/- the camera must be considered first-rate value. There are also listed numerous types of folding plate cameras, focal plane cameras particularly suitable for the photography of rapidly-moving objects, and photographic accessories of all kinds.

The plates and roll films produced by the A. P. M. include the well-known "Marion" and "Paget" plates, and the very popular "Rajar" film packs and roll films. Great claims are made for Rajar films on the ground of high speed and there is no doubt that a photographer who uses these films is employing material of the highest possible quality. Those of our readers who are interested should send a postcard to the firm for the "Rajar" booklet and the 64-page book "Sunshine Pictures," both of which are sent free to any reader mentioning the "*M.M.*"

Loco Trials—(*continued from page* 351)

So many considerations govern the working of modern locos, that it is probably impossible to estimate with accuracy the relative economy of Pacifics and Castles. For instance, the smaller fuel consumption of the G.W. loco may be neutralised in the long run by the greater cost of up-keep of a boiler working at the high pressure of 225 lbs. per sq. inch. The trials may have contributed to the solution of such problems, but such highly technical details are for the consideration of the respective engineers.

As far as the general public were concerned, the trials were entirely in the nature of a sporting event, and not for many years have locomotive affairs been given so much prominence. At some points and terminals of both routes concerned, policemen were required to keep enthusiastic observers under control.

In our opinion chief honours must be awarded to the drivers and firemen who so loyally and successfully upheld the tradition of their respective companies! L.N.E.R. Pacific No. 4474 was in charge of Driver A. Pibwalth with Fireman E. Birkwood. G.W. No. 4074 "*Caldicot Castle,*" Driver E. Rowe, with Fireman H. Cook. The pilotman on the L.N.E.R. loco was Driver Manning of the G.W.R. and the pilotman on the G.W.R. loco on the L.N.E.R. line was Driver Day.

Lives of Famous Engineers—

(*Continued from page* 327)

Eastern" also caused him great disappointment and an enormous amount of worry. He fought his way through all these difficulties with unabated energy, but his exertions left him broken in health. On the morning of 5th September 1859 Brunel was on board the "*Great Eastern*" superintending some unfinished work. Towards mid-day he felt unwell and returned home, when it became evident that he had been attacked with paralysis. For a few days it seemed possible that he might recover, but on 15th September he gradually sank and died.

A Splendid Tribute

On 8th November 1859, at the first meeting of the Institution of Civil Engineers after the deaths of Brunel and Robert Stephenson, Mr. Joseph Locke, M.P., the President, paid the following fine tribute to Brunel :—

"I cannot permit the occasion of opening a new session to pass without alluding to the irreparable loss which the Institution has sustained by the death, during the recess, of its two most honoured and distinguished members.

"In the midst of difficulties of no ordinary kind, with an ardour rarely equalled, and an application both of body and mind almost beyond the limit of physical endurance, in the full pursuit of a great and cherished idea, Brunel was suddenly struck down, before he had accomplished the task which his daring genius had set before him.

"Following in the footsteps of his distinguished parent, Sir Isambard Brunel, his early career, even from its commencement, was remarkable for originality in the conception of the works confided to him. As his experience increased, his confidence in his own powers augmented ; and the Great Western Railway, with its broad-gauge line, colossal engines, large carriages, and bold designs of every description, was carried onward, and ultimately embraced a wide district of the country.

"The same feeling induced, in steam navigation, the successive construction of the "*Great Western*" steamer, the largest vessel of the time, until superseded by the "*Great Britain,*" which was in its turn eclipsed by the "*Great Eastern,*" the most gigantic experiment of the age.

"The great ship was Brunel's peculiar child ; he applied himself to it in a manner which could not fail to command respect ; and, if he did not live to see its final and successful completion, he saw enough, in his later hours, to sustain him in the belief that his idea would ultimately become a triumphant reality."

NEXT MONTH :—

JOSEPH BRAMAH AND THE HYDRAULIC PRESS

Electricity— *Continued from page* 333)

could have got there by accident, and little doubt was felt that they had been inserted on purpose by some ill-disposed person. Again matters were put right, and all went well until nearly 1,200 miles had been laid, and then the cable broke and had to be abandoned after nine days of unsuccessful grappling for it. The

(*Continued foot of next column*)

The Italian Navy—(*cont. from page* 355)

scouts. Eight 4.7 in. guns are mounted in pairs—one on the forecastle, a second between the funnels, a third amidships, and a fourth at the stern. All are mounted on the centre line and each pair revolves on a common turntable, although the individual guns can be elevated independently.

Each gun is protected by a separate shield, which eliminates interference in

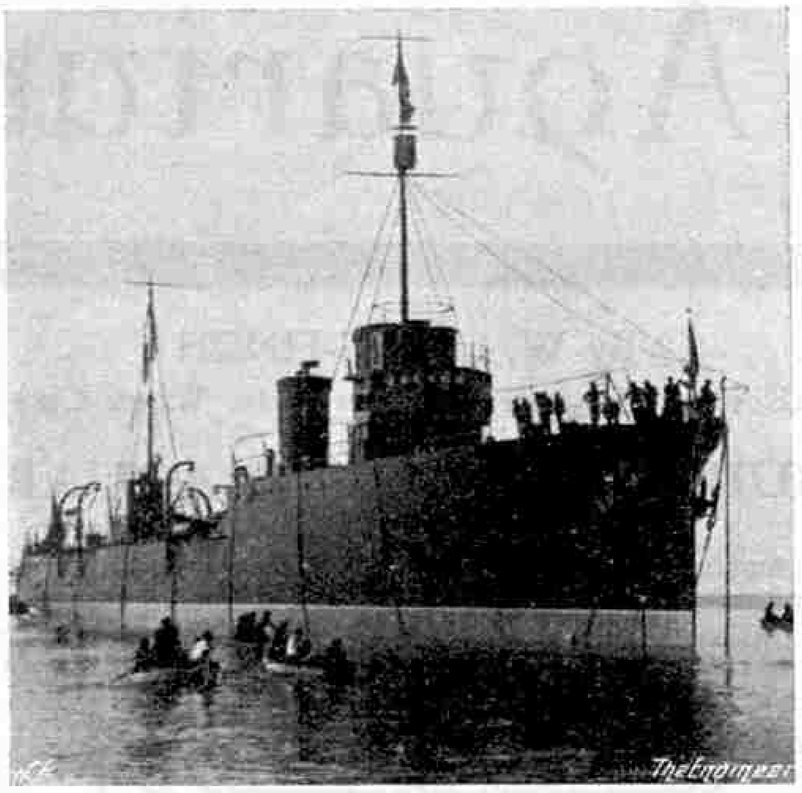


Photo courtesy] ["*The Engineer*"

The "Panther"

loading and working. The guns are 45 calibres in length and there are in addition two 3 in. anti-aircraft guns.

In the matter of torpedo tubes, the "*Lion*" carries two triple 18 in. tubes, and the "*Tiger*" and "*Panther*" each have two double 21 in. tubes.

Each of the three vessels is capable of carrying 60 mines, so that although of comparatively small displacement when compared with vessels of larger types, the new scouts are very formidably armed and their speed will, no doubt, render them of great service for the purpose for which they have been designed.

"*Great Eastern*" then had to return and report failure.

The loss on the cable amounted to £600,000, but in spite of this the promoters were as determined as ever that the cable should be laid. In the next year the Atlantic Telegraph Company was reconstituted as the Anglo-American Telegraph Company, and sufficient cable was manufactured by the Telegraph Construction and Maintenance Company to span the Atlantic and also to complete the 1865 cable if this could be recovered. This company undertook to make and lay the new cable for half a million pounds, and this sum was to be increased to £600,000 if the cable was successful and to £737,000 if the 1865 cable could be picked up and completed. Half this sum was guaranteed by Sir John Pender, one of the most prominent commercial pioneers of British cables. Sir John was one of the 350 holders of £1,000 shares in the 1857 cable scheme, and throughout his life he greatly assisted cable enterprises in all parts of the world. At the time of his death in 1896 he was in control of cable companies having a capital of fifteen millions and owning nearly 74,000 miles of line.

Final Triumph

The "*Great Eastern*" was again chosen for the task, and the ship left the Irish coast on 13th July 1866 and arrived at Trinity Bay, Newfoundland, a fortnight later, having encountered practically no trouble at all. On 28th July the cable was landed amidst remarkable scenes of enthusiasm. The following extract from the diary of the engineer Sir Daniel Gooch gives us some idea of the landing :—

"Is it wrong that I should have felt as though my heart would burst when that end of our long line touched the shore amid the booming of cannon, the wild, half-mad cheering and shouts of the men ? . . . I am given a never-dying thought ; that I aided in laying the Atlantic cable. . . . The old cable hands seemed as though they could eat the end ; one man actually put it into his mouth and sucked it. They held it up and danced round it, cheering at the top of their voices. It was a strange sight, nay, a sight that filled our eyes with tears. . . . I did cheer, but I could better have silently cried."

The "*Great Eastern*" now returned eastward to set about recovering the 1865 cable. This proved to be a matter of great difficulty. Time after time the cable was hooked with the grapnel, only to be lost again almost immediately. On one occasion it was brought to the surface, but in spite of all efforts it slipped away again before it could be secured. After a fortnight of strenuous work success was achieved, the cable was secured and spliced, and a month later was safely brought ashore.

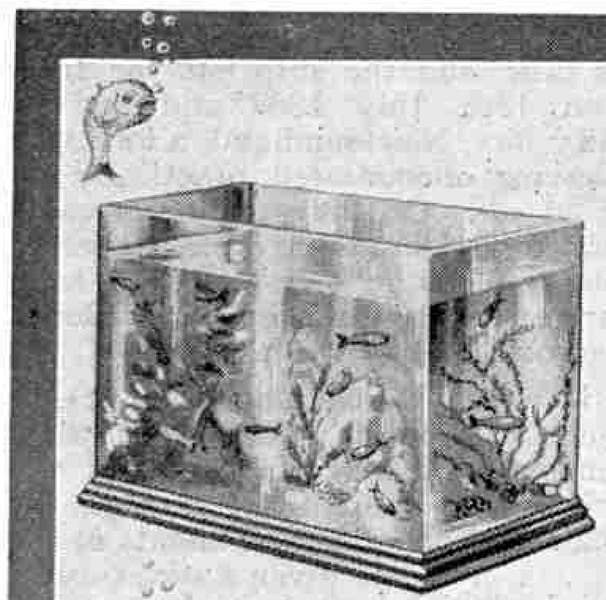
These two cables continued to work until 1872 and 1877 respectively. It is estimated that the total cost of completing the great undertaking, including the cost of the unsuccessful attempts, was nearly two-and-a-half million pounds.

Progress of Cable-laying

Since that time cable-laying has proceeded very rapidly and to-day there are eighteen cables joining Europe with North America, while hardly an ocean or sea in the world is without its electric wires. From England to Cape Town via Ascension and St. Helena there are two ; from Cape Town to Singapore another, with a branch from the Cocos Islands to Australia, which in turn is connected to New Zealand (four cables) and Canada. From Java, via the Celebes, Guam, Midway Is., and Honolulu to San Francisco there is another, this having branches to Japan and China. There are many cables from Britain to the Continent, including one to the White Sea and another to the Faroes and Iceland, while there are several in the Mediterranean. There are five down the Red Sea, four from Aden to Bombay, one to Colombo, another to Seychelles, Mauritius and the Cape, and another to Zanzibar, Beira, Pretoria and Durban. To South America there are two from Europe and four from Africa.

In addition to these cables there are many others linking towns on the same coast, especially in South America, Africa and China, where it is often inconvenient to erect and maintain land telegraphs.

Thus it will be seen that, since the days of the brothers Brett, submarine telegraphy has grown from a seemingly fantastic dream to an invaluable aid to business and to political welfare throughout the world, enabling countries to keep in touch with one another though separated by thousands of miles of sea.



How to Start an Aquarium.

By W. COLES-FINCH

(Resident Engineer, Chatham etc. Water Co.)

II. BUILDING A TANK AQUARIUM

LAST month we gave an outline of the methods that must be adopted in order to make an aquarium of any kind a success. Since that article appeared, many readers have written to ask for instructions for making a more satisfactory aquarium than a simple bell glass, and therefore we give this month a detailed description of a type of tank that has been used by the writer for over 40 years, and has never leaked or given the slightest trouble of any kind.

Slate Foundation

The bottom is of slate (A, Fig. 4). Any builder will saw a suitable piece from some derelict slab in his yard and prepare it at a small cost, or will supply a piece of new slate, drilled and sunk for uprights or columns, grooved to take the glass and with holes bored for fountains and overflow pipes (B. Fig. 4).

Four angle columns of iron or brass grooved for the glass are now required (C, Figs. 3, 5, and 6). These must be provided with iron or brass studs at each end (D, Fig. 6). This may sound rather formidable, but any ingenious Meccano boy can make a wooden pattern for one column and a local metal founder will cast four at a small cost. If desired, their appearance may be improved by machining or draw-filing.

The next item is the wooden framing for the bottom, placed beneath the slate slab to give it support and to form a fixing for the mahogany moulding of the tank (Fig. 2). This framing is of ordinary well-seasoned fir, 2½ in. by 1½ in. The top framing should be of 1½ in. by 1½ in. mahogany (F, Fig. 3), and grooved for the glass as shown (G, Fig. 3). There should be little difficulty in mortising these frames together and ploughing the necessary grooves.

The stud ends of the columns pass through the slate and wooden bottom framing, and through the mahogany framing of the top, the washer and nut at both top and bottom being let flush into the framing (H, Figs. 3 and 5).

Bedding the Glass

Those to whom cost is of no importance may purchase four squares of ¼ in. polished plate glass from a glazier, but a builder probably will be able to supply the glass cheaply from the wreckage of some shop front. It will not matter if the glass is slightly scratched for this will not readily be discerned when the tank is filled with water.

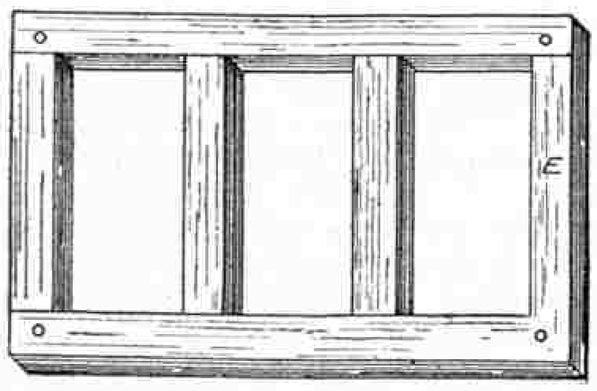


Fig. 2. Base for Slate

The glass should not be cut to size until the parts of the tank have been tried together and definite measurements taken. It would be wise to ascertain the thickness of the glass available for the purpose, however, and to make the grooves in slate and columns $\frac{1}{16}$ in. fuller than the glass. The glass should be bedded in the slate grooves and columns with liquid red lead and gold size.

All that remains is to encase the top and bottom framing of the tank with moulded or beaded mahogany fillets, carefully mitred at the angles and fitted round the columns (I, Figs. 3 and 5). The help of a joiner may be advisable in this final stage of the work. The tank is then complete.

If the woodwork is carefully French-polished the tank will be one of which the owner may be justly proud. It will be worthy of a place in any room and if carefully stocked and given the little attention an aquarium demands it will be a source of never-ending pleasure.

In the matter of reliable controls for the fountains and unions for passing pressure water and overflow pipes through the slate bottom, a plumber should be consulted, but nothing difficult presents itself in this matter.

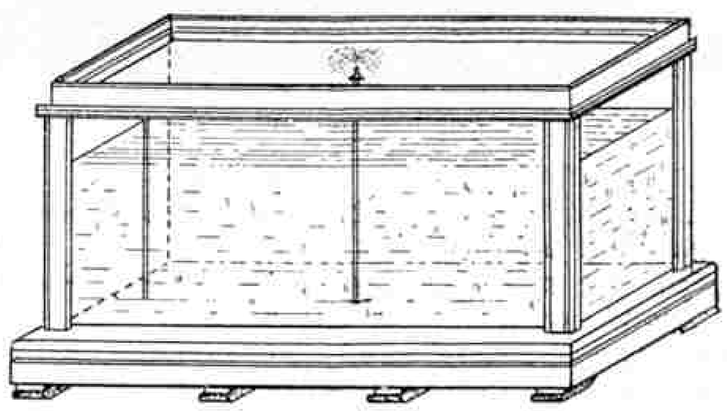


Fig. 1. Elevation of Tank

It must be borne in mind that considerable strength is necessary in the construction of a tank, for each cubic foot of space will hold 6¼ gallons of water weighing, say, 62 lb. The tank suggested has an inside measurement of 28 in. by 16 in. and is 13 in. deep. If filled to a depth of 12 in. it will contain some 19 gallons of water weighing 1¾ cwt., and yet it is by no means a large tank.

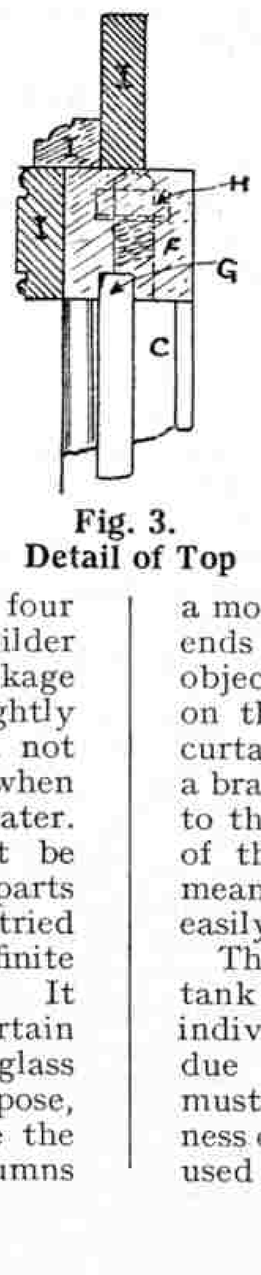


Fig. 3. Detail of Top

Importance of Surface Area

One important point making for success in an aquarium is that surface area must never be sacrificed to greater depth, for the amount of the life-giving oxygen taken up by the water is in proportion to the area of the surface of the water exposed to the atmosphere. For this reason it is suggested that, although the tank is 13 in. deep, no more than 9 in. or 10 in. of water should be placed in it. The additional depth is allowed in order that the floating plants may better be seen at the surface and that certain of the pond creatures may not readily escape.

Were it not for purposes of observation, the tank would be a more desirable habitation for its occupants if the back and both ends were also of slate, leaving only the front of glass. This objection may be readily overcome, however, by arranging curtains on three sides of the tank, to be drawn when desired. These curtains may be fixed on a brass rod or wire attached to the moulding at the top of the tank, and by this means judicious shading is easily obtained.

The dimensions of the tank may be varied to suit individual requirements, but due consideration always must be given to the thickness of the various materials used in its construction.

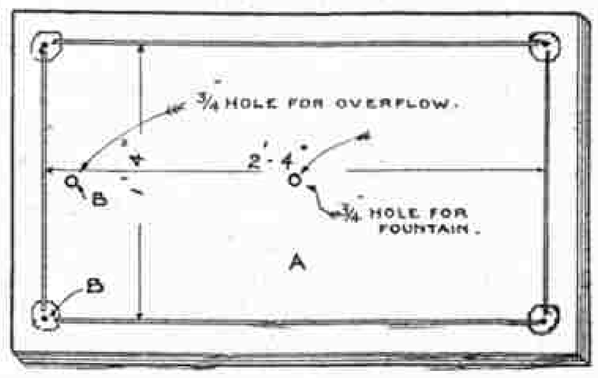


Fig. 4. Grooving of Slate

The particulars here given form a reliable guide in this respect.

Arranging a Fountain Jet

If it is considered too elaborate a business to connect town's water (under pressure) to the tank, a substitute may be arranged. Upon any high shelf near by, or in the room above, a small open tank may be fixed and from this a ¼ in. "compo" tube carried to the fountain inlet. A pail of water could then be siphoned from the aquarium and a pail of fresh water poured into the higher open tank, and this water, in the form of a tiny jet, would give a short but pleasing display adding greatly to the delight of the occupants of the tank.

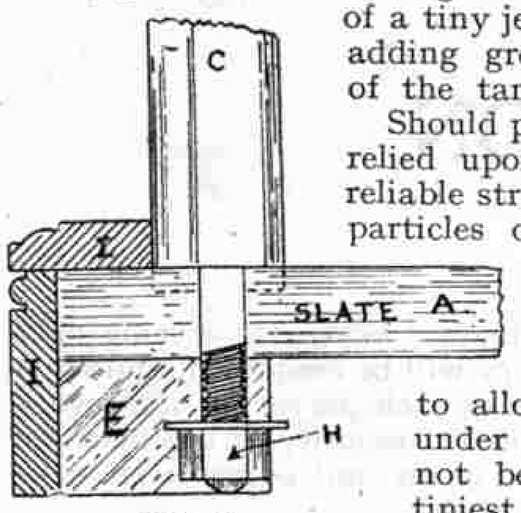


Fig. 5.
Detail of Bottom

Should pressure water be laid on and the overflow relied upon to govern the level of the water, a reliable strainer should be provided to keep floating particles of water plants or food from choking the overflow, with the unpleasant result of flooding the room. The writer has good reasons for suggesting that it is well to decide never to allow a pressure water jet to play except under close observation. Certainly it should not be left for a week-end, even with the tiniest jet playing, trusting to the overflow to regulate the level of the water. Many things may happen during one's absence!

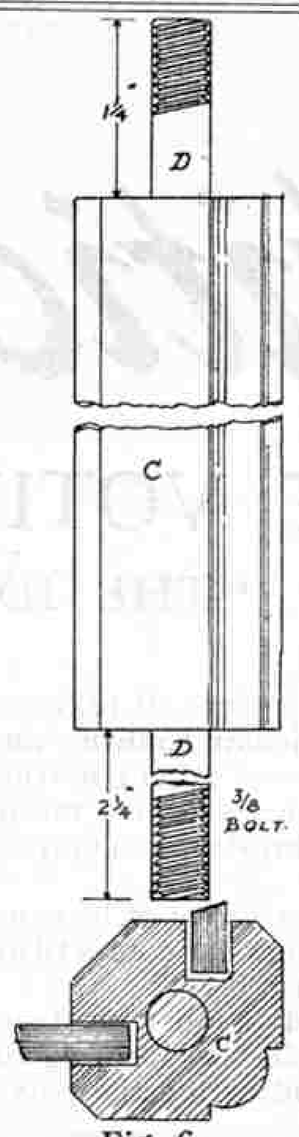


Fig. 6.
Detail of Column

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New Wonders of Wembley—

(*Continued from page* 353)

and New Zealand, Ceylon, Burma, Newfoundland, Malaya and the Africas have all reopened with increased spendour.

In the Hong-Kong section one is invited to lunch from real Chinese fare, which includes bird's-nest soup, "sam-shi" of shark's fin, lychees, curnquet chow-chow and melon seeds. I did not consider that my taste was sufficiently educated for such delicacies, however, and departed in search of the more prosaic menu of our English restaurants!

Perhaps one of the great fascinations of Wembley is the fact that, at every turn, one never knows quite what to expect, for all kinds of weird and unusual objects are suddenly encountered in out-of-the-way corners. It is never wise, for example, to offer bread or choice buns to the stately swan that rides so gracefully near the edge of the lake, for one usually gets almost vexed at the aloofness and cold disdain with which he treats such tempting morsels, before discovering that he is made of wood! And it is just as one makes the discovery that everybody near laughs—probably because many of them have been similarly caught! It is also somewhat trying for the nerves, as one glides over the lake in an electric launch, to be suddenly confronted with a huge crocodile, apparently about to slip into the water from one of the banks. Again, imagine the havoc created amongst one's sisters when suddenly meeting half-a-dozen frogs, or toads, each about two feet in length, and all breathing from their throats in the correct batrachian fashion! Of course, being a Meccano boy, I always look for the "why and the wherefore," and quickly noted the partly concealed pipe connected to each frog that causes such a realistic impression.

New Rolling Stock for L.N.E.R.—

(*Continued from page* 347)

catch on the garnish rail. A lifting bar is fitted on the light and the customary lifting strap is, therefore, omitted.

All the doors are fitted with "Kaye's" patent wedge locks, with safety catch on the inside handle.

Interior Finish

The interiors of the compartments are finished in varnished teak, the ceilings being covered with millboard. Advertisement frames of varnished teak are placed above the seat backs.

Woven wire seats are used throughout. The seats in the first class smoking compartments are upholstered in leather, and those in the first class non-smoking compartments in best blue cloth. The seat front rail is faced with leather cloth. No buttons are used.

The seats in the second class compartments are upholstered in crimson carriage pile cloth, and those in the third class in leather cloth.

Spring blinds are fitted to each quarter, and there are two standard 4 in. torpedo ventilators in the roof of each compartment.

Each vehicle is equipped with passenger communication apparatus.

The carriages are finished outside in varnished teak, the underframes being painted teak colour, and the ironwork details finished in black japan.

Two Reliable Crystals

From tests that we have carried out recently, we are led to the conclusion that the user of a crystal set who employs a "Talite" or "Hertzite" supersensitive crystal need entertain no doubts as to whether he is obtaining the best results possible from his detector. These two popular crystals are made by Messrs. Harding, Holland & Fry Ltd. (52, Queen Victoria Street, London, E.C.4), a firm whose products are the result of several years' experience and research in the refinement of metals. The makers claim that "fiddling about" with a cat whisker is unnecessary as Talite is active all over and is, in fact, "all live spots" and each piece is tested before being sold. The selection of a reliable crystal is an important matter in achieving good reception and we strongly recommend Meccano boys to test a "Hertzite" or "Talite" on their own sets and compare results. Our readers may obtain either of these crystals from any wireless dealers, or direct from the manufacturers.

OUR MAIL BAG

A. Landell (Montreal).—You have certainly taken a long time to write to us, but now that you have broken the ice we hope to hear from you regularly. Your experience of mumps was certainly trying, but we hope by this time you have recovered. You appear to live in a warm quarter, with fires in front and behind your house. We hope that by now you have your Meccano fire alarm installed. Why not keep a Meccano fire escape handy in case of emergencies?

R. Cose (Christchurch, N.Z.)—We are glad to welcome you back to the fold. There is joy in Meccanoland over the return of each one of the few misguided ones who leave our sunny shores. We are sorry we are not able to use your article, as we recently published one on the same subject. We hope you will try again.

A. G. Carnacho (Georgetown, Demerara).—We are pleased to hear that your No. 7 Outfit keeps you happy and busy. Guild literature is being posted to you separately.

G. H. Pollard (Leeds).—We know your city well, and the glorious country round it. Why should you be too frightened to write to us—We never heard of such a thing! We shall expect to hear from you regularly, George.

G. Howard (Mosgiel, N.Z.)—We were interested in reading your account of your camping out experiences in the South Island, and we look forward to receiving your snapshots. We had already heard of the epidemic of Infantile Paralysis in New Zealand, which we hope has now abated.

T. S. Nagi (Amritsar, India).—Under separate cover we have sent you a list of Guild members, and we hope your efforts to form a club will meet with success. Competition entry received.

H. G. Slade (London).—Thanks for your suggestion for attaching wheels to locos. The new Hornby Electric Loco, which will soon be on the market, has wheels fitted in this way. The idea is quite sound, but of course not new.

T. Appaduray (Perak, Malay States).—One of the most useful sides of the Meccano Guild's activities is the encouraging of friendliness between boys of all countries by means of its Correspondence Club. We are pleased that you are making such good use of the club and that you enjoy the letters that you receive.

V. H. Alpe (Kandana, Ceylon).—"I have a great desire to see the Meccano Factory, but I suppose I should require a sort of Magic Carpet to do that. I doubt if I shall ever have a chance of coming to England. I shall have to be contented with looking at it through Dick's eyes. Thanks to Meccano I shall soon have a new chum in England." At all events through the "*M.M.*" you are kept posted regarding all the doings in Meccanoland, and this we are glad to see gives you pleasure. Who knows but what the Magic Carpet may some day come along your way and ship you over to us? More wonderful things than that have happened.

R. B. Sibson (Cliffe-at-Hoo).—We are pleased to note your keen interest in the study of nature. We hope to publish further bird articles. You would probably find pleasure in reading White's "*Natural History of Selborne*," and some of the fine books written by the late W. H. Hudson.

G. F. Raynor (Cholsey).—Most fathers are just like your own. They say what a wonderful publication the "*M.M.*" is for boys, and then they proceed to read it all through themselves! The same kind of thing happens with Meccano and Hornby Trains. It's just as well, anyhow, because its a fine thing for fathers and sons to have common interests.

N. Fraser (Canterbury, N.Z.)—Wiseman's Meccano Club with its 710 members, is amongst the most successful and the biggest in the world, and you are lucky to be a member of it. Thanks for interesting snapshots.

E. Green (Torrensville, S.A.)—You seem to be a fine sturdy Meccano boy judging by your photograph. We hope you will make full use of the Guild Correspondence Club.

Keith Boothby (Clarence River, N.S.W.)—Many thanks for the two copies of the "*Sydney Mail.*" The pictures were interesting and excellent. Your cricket record is a fine one, and in a few years' time we shouldn't wonder if we saw you over here with the test team. We shall give your fellows a great welcome next year, and we shall try to treat them as well as you treated Hobbs, Sutcliffe and Co.

T. Pattle (Keetmanshoop, S.A.)—"We are having glorious rains here just now and the country is looking beautiful." We have rain most days, Tom, but we rarely call it glorious. We are sorry for the mistake in the Overseas Closing Date for the Competition and we will see that this does not happen again.

Competition Corner

CRICKET VOTING COMPETITION

"THE IDEAL ELEVEN"

The cricket season is now in full swing and we are all taking a keen interest in the progress of our own particular counties and in the doings of the "star" batsmen and bowlers of other counties. We all have our own opinions in regard to the respective merits of the great players of to-day, and it is very interesting to compare ideas on this fascinating question.

In order that our readers may have an opportunity of learning one another's views we are announcing this month a competition on the subject: "THE IDEAL CRICKET ELEVEN."

All that competitors have to do is to send in on a postcard the names of the eleven players they would select as forming the best possible cricket team, at the same time indicating the player they would choose to captain the team. When the closing date of the competition arrives, each entry will be examined, and from the total number of votes in favour of each player we shall work out the team that finds favour with the majority of competitors.

There are no age limits in this contest and competitors may submit more than one team if they wish.

Prizes of Meccano goods to the value of £1/1/–, 15/–, 10/6 and 5/– respectively, will be awarded to the four competitors whose selections are most closely identical with the result of the total vote.

Entries must reach this office not later than 31st July (Overseas, 30th November).

Seventh Drawing Competition

During the next few weeks many of our readers will have left their usual haunts for a little while and will be revelling in the delights of sea and shore. There are few more interesting sights, especially to those who live in inland counties, than a pleasure boat or fishing boat under full sail, slipping through the water. It is extremely interesting to try one's hand at capturing on paper the charm of a sailing boat and we therefore announce this month as the subject of our Seventh Drawing Competition, "A PLEASURE BOAT OR FISHING BOAT UNDER SAIL."

The competition will be divided into two classes, A for those of 16 and over and B for those under 16. Four prizes are offered—Drawing or Painting Materials (or Meccano products if preferred), to be selected by the winners, to the value of 10/6 and 5/– respectively for the first and second in each section.

Competitors who wish their drawings to be returned must state this at the time of sending in their entries and must also enclose stamped envelopes of suitable size.

Closing date, 31st August (Overseas, 30th November).

Results

April Essay Competition

The task of selecting "The Seven Modern Engineering Wonders of the World" apparently was a pleasant one to a very large number of readers. In no case were two sets of selections identical, or even approximately so, which was not surprising, as of course such a task must necessarily reflect the personal inclinations and opinions of each entrant. In judging the entries for this competition great stress was laid on the reasons given for each selection.

We look forward with interest to the voting competition arising out of this contest, which we shall announce in October when the Overseas essays have come to hand.

Prizes have been awarded as follows:—Meccano Goods value £1/1/–, G. S. Marsh (Thornton-le-Fylde) and Ivor G. Thomas (Ynyshor, Glamorgan); Meccano goods value 10/6, Wallace Russell (Lewes), and W. Heatley (Hollybush by Ayr).

We hope to publish the winning essay at a later date, after the close of the voting competition.

Fifth Drawing Competition

As we expected, this proved to be a very popular Contest, and the majority of entries were of quite a high grade. So many steam wagons are to be seen along our roads nowadays that no observant lad should find any difficulty in retaining a mental picture of at least one type of these efficient vehicles. A very noticeable fault was the general exaggeration in the diameter of the boiler in the case of horizontal-boiler types. In many actual types the tall funnel does look disproportionate and a fair number of competitors sought to improve matters by increasing the girth of the boiler at the smoke-box end. This, of course, quite spoilt the effect.

The awards in this contest are as follows:—Class A—First Prize, George Wood (Halifax); Second Prize, A. W. Weeks (Yiewsley, Middlesex). Class B—First Prize, L. B. Braithwaite (Lancaster); Second Prize, N. Riddiough (Bradford).

"Palindromes" Competition

Entries flocked in merrily, and among them were many old favourites together with some strikingly novel ones. It was realised by many competitors that to make an original Palindrome is much more of a mental task than to solve a Cross Word puzzle!

Awards:—First Prize (Meccano goods value £1/1/–), K. Paddon (Croydon); Second Prize (Meccano goods value 10/6), J. E. Malcolm (Stirling); Third Prize (Meccano goods value 5/–), A. Steggall (S. Shields).

Competition Closing Dates:

HOME.

June Essay	31st July.
Seventeenth Photo	31st July.
Cricket Voting Contest ...	31st July.
Sixth Drawing	31st July.
Seventh Drawing	31st August.

OVERSEAS.

"Coral Island" Mistake ...	31st August.
Essay (April)	31st August.
Fourteenth Photo	31st August.
Fifth Drawing	31st August.
Guild Motto	30th September.
Essay (Easter Holiday) ...	30th September.
Painting (Hornby Train) ...	30th September.
Fifteenth Photo	30th September.
Sixth Drawing	31st October.
Sixteenth Photo	31st October.
Club Programme (Members Only)	31st October.
Seventeenth Photo	30th November.
Seventh Drawing	30th November.
Cricket Voting Contest ...	30th November.

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of any competitions for which they intend to enter. Week by week we receive entries for various competitions that have been closed for some time. Some of these entries are excellent and it is a pity for competitors' good work to be wasted on account of losing sight of the closing date.

Overseas Results

"My Favourite Railway"

The task of judging the large number of entries that arrived from every quarter of the globe was greatly lightened by the excellent quality of the essays. Many of the entries reached a very high standard of literary merit, and the reasons given for favouring a particular line were very varied. The affection of one of the prize-winners is claimed by a line that provides much fun by its prejudice against fast travelling. Our essayist claims that a carriage near the engine is dangerous on account of possible boiler explosions, that vehicles at the rear of the train break away, and that carriages in the centre, being built for ornament, have unreliable—even rotten—floors. Yet this line is his favourite!

Awards:—Class A, First Prize (by choice a No. 1 Crystal Receiver), C. E. Heald-Warner (Swakopmund, S.W. Africa); Second Prize (Meccano Goods value 10/6), James Classen (Magaliesburg, Transvaal). Class B—First Prize (Meccano goods value £1/1/–), L. Fisher (Johannesburg); Second Prize (Meccano goods value 10/6), Tony MacLachlan (Dunedin, New Zealand).

Cycling Hints Competition

The entries for this competition indicate by their number that among Meccano boys the "push-bike" still holds pride of place, both as a means of transit and as an interesting hobby. It was specially interesting to find that most of the hints were in the direction of remedies for various troubles and contingencies of the open road that had befallen competitors themselves.

"Rover's" final selection was as follows:—First Prize, H. Fox (Christchurch, New Zealand); Second Prize, Paul Shave (Remuera, New Zealand). Consolation Prizes, Alick Young (Grahamstown, S. Africa), and John Reid (Oamaru, New Zealand).

Third Drawing Contest

Our Overseas readers in many cases were at a grave disadvantage in living far beyond the range of modern tramway systems, and from many letters received it is readily apparent that this fact seriously limited the number of entries for our Third Drawing Contest. V. R. Heeramaneck (Bombay) sent in a very creditable effort and we have awarded him a prize of Meccano goods, to be selected by him, to the value of 10/6.

"Suggestions" Contest

We were pleased to notice how many of the suggestions submitted to us by Overseas readers were of a serious and constructive nature as distinct from the merely "pastime" competitions which find a regular place in so many journals. Thus, further competitions along the lines of the memorable "Lynx-Eyed" contests were repeatedly suggested, and some of the variations were distinctly ingenious.

Very careful consideration was given to every suggestion submitted, and the four prizes of Meccano Double Headphones or No. 1 Radio Receivers were awarded to Leon Boxill and Zena Boxill (Port of Spain, Trinidad, B.W.I.), Leonard Fisher (Johannesburg) and E. H. Whitney (Maclear, South Africa).

July Puzzle Competition

WHEN the blazing hot weather came along last month I told myself that the entries for the June Puzzle Competition would show a big decrease as compared with those of the previous month. I was agreeably surprised therefore to find that, as the days went on, entries came rolling in thick and fast, and instead of the final total showing a decrease it showed quite an appreciable increase on the May total!

I think the explanation for this state of affairs is to be found in the fact that competitors were not required to concoct palindromes or to worry out cross-word puzzles, but simply had to tackle a variety of puzzles of a less brain-racking nature, and therefore more in keeping with the weather. I was particularly interested to receive quite a number of letters from competitors in which they told me that they had taken their beloved "*M.M.*" out-of-doors, settled down in some shady nook, and then and there tackled the puzzles!

The word-building puzzle (No. 90) has proved very popular and next month I hope to publish the most successful solution sent in.

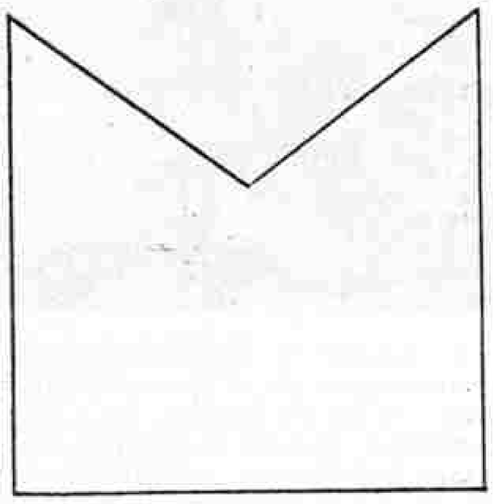
This month I am announcing a competition on similar lines to that for last month. Each competitor must send in the solutions of five of the puzzles on this page. In the case of puzzles requiring a diagram for their solution, a rough sketch will suffice so long as it makes matters perfectly clear.

For this competition I am offering three prizes—Meccano goods to the value of £1/1/–, 10/6 and 5/– respectively.

The closing date of this competition is 31st July and there is no overseas section.

Puzzle No. 102.

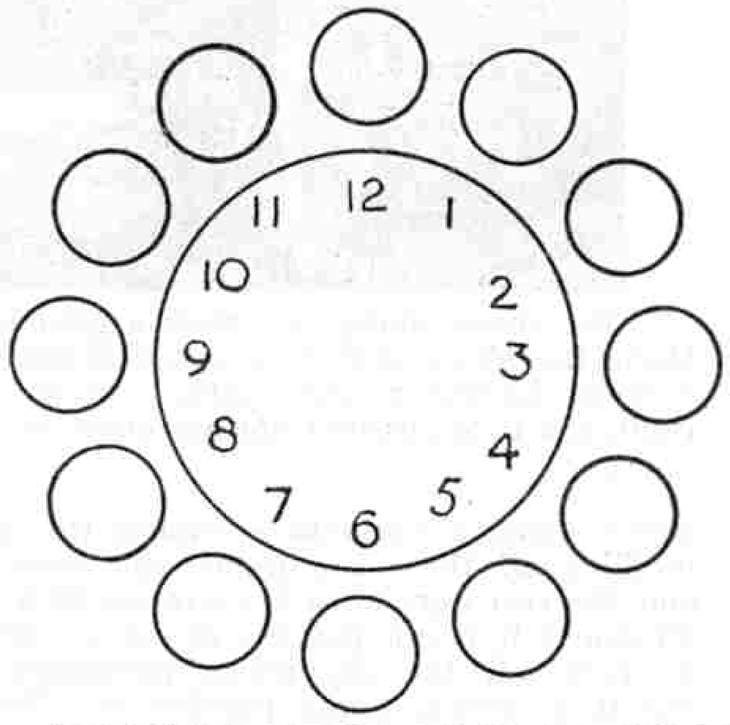
How can the following figure be divided into four parts each of exactly the same size and shape?



Puzzle No. 103.

By re-arranging the letters in each of the following words or phrases the name of a town or county will be formed:—1. Try our hat game; 2. Rats game; 3. The sound; 4. Don't prove; 5. Lend a crumb; 6. Fix two eels; 7. Sid robs a tar; 8. Rose cut leg; 9. Aim to send; 10. Tom hops rut; 11. Ring both; 12. Nut lard.

Puzzle No. 104.



Arrange twelve pennies or counters in a circle as shown in the diagram above. Now take up one penny at a time, pass it over two pennies and place it on the third penny. Take up another single penny and do the same thing, repeating the process until, after six moves, the coins are arranged in six pairs in the positions 1, 2, 3, 4, 5, 6. You may travel in either direction round the circle at each move and the two pennies jumped over may be either two separate coins or a pair.

* * * *

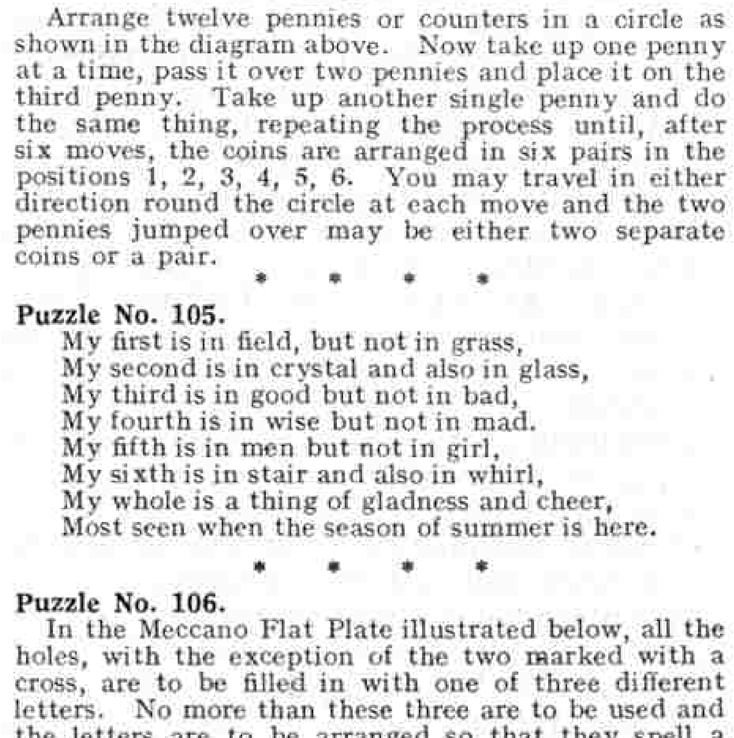
Puzzle No. 105.

My first is in field, but not in grass,
My second is in crystal and also in glass,
My third is in good but not in bad,
My fourth is in wise but not in mad.
My fifth is in men but not in girl,
My sixth is in stair and also in whirl,
My whole is a thing of gladness and cheer,
Most seen when the season of summer is here.

* * * *

Puzzle No. 106.

In the Meccano Flat Plate illustrated below, all the holes, with the exception of the two marked with a cross, are to be filled in with one of three different letters. No more than these three are to be used and the letters are to be arranged so that they spell a common English word in twelve different directions.

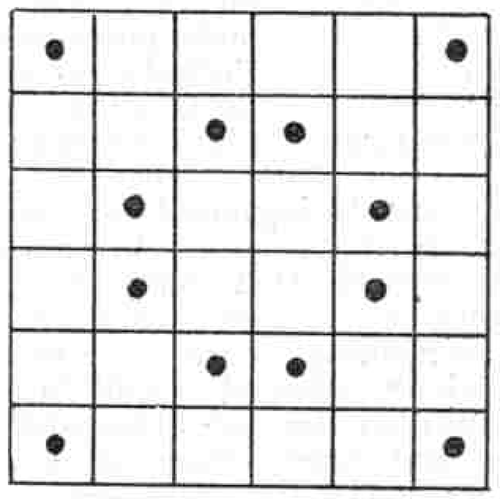


Puzzle No. 107.

Give a list of all the words in the English language ending in "dous."

Answers to Last Month's Puzzles

No. 91. The following figure shows how the coins must be arranged.



No. 92. John Underwood, Andover, Hants.

* * * *

No. 93. The sentence is as follows:—That man says that Mary and Jack saw many small bags at an art bazaar at Mandalay.

* * * *

No. 94. There were eight persons in the room. These were an old lady, one of her daughters with two sons, another daughter with two daughters and the daughter of a daughter who was not present.

* * * *

No. 95.

B u o y
d O l l
b e A d
m e a T

* * * *

No. 96. The missing words are:—I, Is, Sir, Rise, Reins, Insert, Entries, Interest, Resetting.

* * * *

No. 97. (1) Jenny Wren; (2) Jack Daw; (3) Tom Tit; (4) Secretary Bird; (5) Cygnet; (6) Ruff; (7) Adjutant; (8) Magpie; (9) Kingfisher; (10) Lark; (11) Swallow; (12) Turkey; (13) Ducks and Drakes.

* * * *

No. 98. 1. Time, emit; 2. Now, won; 3. Not, ton; 4. Pot, top; 5. Dim, mid; 6. Mad, dam.

* * * *

No. 99. The three proverbs are:—1. Rolling stones gather no moss; 2. Fine feathers make fine birds; 3. Time and tide wait for no man.

* * * *

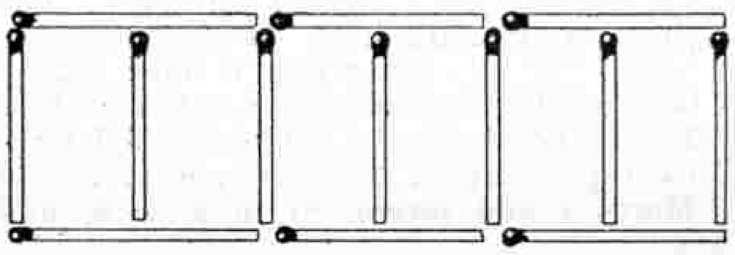
No. 100. The window was diamond-shaped and was enlarged to a square.

* * * *

No. 101. The towns indicated are:—Rome (roam); Leeds (leads); Ayr (air); Peel; Leek; Cork; Crewe (crew); Berlin; Toulouse (too loose); Toulon (too long); Harrow and Rugby.

Puzzle No. 108.

The following diagram, made with thirteen matches, represents a farmer's hurdles arranged so as to enclose six sheep pens all of the same size. One of these hurdles was stolen and the farmer was unable to replace it. After a great deal of thought he found that, by re-arranging the remaining twelve hurdles, he could still enclose six pens of equal size. How did he do it?



The Secretary's Notes

Guild Happenings

From every point of the compass enthusiastic reports are reaching me from club secretaries and they one and all make pleasant reading. Entirely out of date is the idea that a Meccano Club depends for its existence on a winter hobby, and is organised for that hobby alone! It is reasonable to assume from these reports that summer activities occupy almost as high a place in the esteem of club members as do those of the long dark nights when clubroom fires "glint cheerfully on Meccano Crane and Hornby Train, and happy eager faces," as one member poetically expressed it. Thus, one progressive club secretary in the Southern Midlands sends me a neatly-printed card giving the dates and particulars of summer events in similar fashion to a cricket fixture list. Organised visits to railway works and various other centres of interest to the mechanically-minded are varied by country photographic rambles, cricket matches, small gymkhanas to raise funds and even a club "Week-end Camp." Then again, a well organised Lancashire club had a day at the seaside recently, when the visitors were taken charge of and splendidly entertained by the local Meccano Club.

School Clubs

The number of clubs organised in various schools, both public and private, continues to grow, and among them are to be found some of the strongest and most enthusiastic clubs in the Guild. Such school clubs have many points in common in their development. Usually they owe their origin to some boy who has realised the delights of Meccano and Hornby Trains and is a regular reader of the "*Meccano Magazine.*" His enthusiasm spreads to others, and soon a small group of would-be model experts forms. In many cases such a development has reached the approving notice of the Headmaster and he has fostered it by commending the club idea to one of his masters.

The Correspondence Club

Large numbers of Guild members continue to write to me asking to be put into touch, through the Guild Correspondence Club, with Colonial or foreign members having similar interests. The work of this valuable agency is now highly developed. For instance, last month a French boy living in Belgium asked for a correspondent of his own age living in Morocco and interested in stamps, and within about a fortnight a suitable friend fulfilling all these conditions was found and the two were already corresponding! Of course it is not possible in every case to fulfil all the conditions demanded, but it is always found possible to offer a very attractive alternative correspondent, and my files at present hold the names of some remarkably interesting Meccano boys in such places as Orkney, Belgium, France, Ireland, Palestine and India. Naturally, the great majority of applications I receive are from boys in the British Isles, mostly in need of correspondents in Canada, Australia, New Zealand, South Africa and other parts of the Empire. So many of these applicants are waiting patiently at the present time that I am publishing a list of the initials and favourite subjects of a small number of them, so that any Overseas reader may select one of these enthusiasts from the Homeland and write him a letter, addressed in the first place "c/o Guild Secretary, Meccano Ltd., Binns Road, Liverpool." Such letters will be forwarded to the owner of the initials, and his reply, coming through me in the first case, will be duly re-posted overseas.

Boys in the British Isles requiring Canadian or American Correspondents.

(The letters in brackets after a correspondent's initials indicates his favourite subjects according to the table printed below).

R.N. (E.), R.F. (C.), J.E.B. (E.), R.P. (G.), J.S.D. (S.C.), G.D. (S.C.), M.H. (W.), C.W. (S.C.), M.W. (A.), N.F. (G.), F.S. (G.), S.P. (E.), W.R.C. (E.), A.H. (E.), G.B. (S.C.), O.H. (S.C.), E.J.S. (S.C.), J.L. (E.), E.Y. (S.), R.T.M. (E.), A.M.B. (P.), D.R. (A.), S.G. (C.), M.B. (W.), R.B. (S.), A.A. (E.), G.W. (G.), J.G.N. (E.), T.W.S (A.), L.C. (S.C.), N.F. (N.S.), I.L. (C.), S.M. (W.), G.S.S. (N.S.), F.J.J. (N.S.), F.M. (G.), A.D. (E.), F.I. (P.), R.K.G. (S.C.), H.C.D. (S.C.), G.B. (P.), E.J.W.J. (P.), W.W. (E.), A.B. (W.), D.S.W. (S.C.), F.C. (E.), J.B.W. (S.C.), T.F. (S.C.), C.W.H. (E.), W.M. (P.), J.W.M. (E.), A.W. (E.), A.G. (W.), V.P.C. (G).

Boys in the British Isles requiring Australian and New Zealand Correspondents.

L.H. (T.), N.K. (G.), C.B. (W.), A.E.H. (S.C.), R.B. (G.), H.B. (S.C.), W.S.W. (E.), G.C.S. (G.), K.W. (N.S.), E.L. (N.S.), C.B. (E.), R.W. (F.), L.D. (P.), P.M. (S.C.), G.C. (J.W.), A.W. (E.), A.D.B. (E.), M.S. (S.C.), D.W.J. (E.), S.M. (S.), L.W.W. (S.)

A Fine Club Exhibit

The above photograph gives a good idea of the splendidly-arranged display of the 1st Herne Bay Meccano Club at the Spring Show of the local Horticultural and Industrial Society, to which we referred last month. The Leader, Mr. W. H. Russell, is standing on the extreme right, and C. W. Russell, the Secretary, is second from the left.

Boys in the British Isles requiring South African Correspondents.

C.A.P.B. (E.), A.F. (S.C.), V.S. (E.), T.P. (S.C.), E.H.M. (W.), M.S. (S.C.), P.T. (J.W.), A.H.O. (E.), H.J.B. (N.S.), I.S. (N.S.), M.T.P. (S.C.), D.L. (E.), J.L.A.R. (C.), A.McK. (E.S.C.), W.S. (N.S.), E.A.W. (S.C.), J.R.T. (J.W.), L.J.B. (S.)

(C.)—Cycling. (E.)—Engineering. (G.)—General Subjects. (N.S.)—Nature Study. (P.)—Photography. (F.)—Farming. (J.W.)—Joinery and Woodwork. (W.)—Wireless. (S.)—Sports. (S.C.)—Stamp Collecting. (T.)—Travel. (A.)—Art.

A Wireless Enthusiast

We have pleasure in reproducing a photograph of John Deaves, aged 14, of Bures, Suffolk, who is an enthusiastic member of the Meccano Guild and holds the Recruiting Medallion. John's chief interests are Meccano and Wireless, and with the latter subject especially he is very much at home. In the spring a Wireless demonstration was given to a crowded meeting at Bures, and in addition to manipulating the four-valve set loaned by his father, John gave an interesting introductory lecture which was much appreciated by the audience and was praised by the local newspaper.

CLUB NOTES

St. James' Choristers (Exeter) M.C.—The membership has increased from 21 to 51 since last Christmas, and it has been found necessary to divide the members into divisions on the "House" system, and until larger premises are available the "Houses" have to meet and work separately. The chief task of last session was the completion of a model of Exeter Cathedral, made entirely of Meccano parts. This model, complete with bells, was most favourably commented upon by the local press, and was exhibited at various Exeter schools in turn. Merit Medallions have been awarded to L. W. Badcock and L. G. Lendon. Club roll: 51. *Secretary*: L. Mathews, 44, Rosebery Road, Exeter, Devon.

Great Baddow (Chelmsford) M.C.—Has held an Exhibition to raise funds for purchasing a cricket set, etc. Each member contributed a model and Headquarters loaned a Derricking Crane which attracted considerable attention. The total proceeds, including those from a whist drive and a special donation, amounted to £4 15 0. Club roll: 14. *Secretary*: J. Boreham, Post Office, Baddow Road, Chelmsford.

Loanhead Boy Scouts' M.C.—An excellent programme of rambles and excursions has been arranged for the summer. Members are keen to start a Club Magazine. Club roll: 14. Average attendance: 8. *Secretary*: Bertie Warnock, R. P. Manse, Loanhead, Midlothian.

Maryfield M.C.—This newly-affiliated Club was founded in October 1924 with a membership of six, which soon increased to ten. Two concerts raised enough funds for a joint Social Evening and Exhibition of Meccano Models and Hornby Trains, and these events were followed by a Model-building competition for which prizes kindly offered by Mr. Webster were awarded as follows: 1. S. Smith (Crane); 2. D. Blaney (Telephone); 3. G. Small (Maxim Gun). Visits have been made to the Municipal Gas Works and Electricity Generating Station. *Secretary*: S. Smith, 14, Maryfield Terrace, Dundee.

Luton M.C.—A well-organised session concluded with a Social Evening, at which prizes were presented for various competitions. The Leader, Mr. S. Burgoyne, gave a special prize for the member whose attendance throughout the session was most regular. Club roll: 26, average attendance: 18. *Secretary*: L. Goldsmith, 69, Tennyson Road, Luton.

Ilfracombe M.C.—The latest Exhibition was most successful, and from photographs of the exhibits it is apparent that no pains were spared to achieve this end. Seven Hornby Trains contributed to a very extensive model railway layout, and a collection realised £4 6 6. Club roll: 28. Average attendance: 22. *Secretary*: W. Webber, 14, Springfield Road, Ilfracombe.

Marsh Street (Walthamstow) M.C.—Members have decided unanimously to continue paying subscriptions during the summer in order to build up a strong financial position for Winter activities. Saturday mornings are being devoted to tennis lessons for learners, through the kindness of the Club Leader. Club roll: 19, average attendance 13. *Secretary*: C. W. Redfern, 34, Church Hill Road, Walthamstow.

Stockton-on-Tees M.C.—The most recent events of interest have been the General Meeting, Secretary's Reports, etc., and a Hornby Train display night. Club roll: 12. *Secretary*: Norman Middleton, 14, Victoria Avenue, Norton Road, Stockton-on-Tees.

Handsworth (Birmingham) M.C.—Much interest is being shown by members, though the continued good weather has affected attendances at indoor meetings. On May 13th the club held a *Mock Trial* the part of judge being taken with becoming dignity by the Rev. Royle, Padre of Toc. H. Mark VI. There was a good audience, including contingents from Bearswood M.C. and King Edward's M.C., and a message was read from the Guild President. A games programme has now been added to the club's activities and Boxing and Single-stick are popular. In addition Cricket and Air-gun sections have been formed, and the Dramatic Section is busy choosing a play suitable as its next production. Club roll: 40. *Secretary*: Norman J. Robertson, 30, Hinstock Road, Handsworth Wood, Birmingham.

South Park (Ilford) M.C.—Mr. H. J. Charlton, the Leader, reports that the first session has been successful beyond all expectation. Concluding the syllabus with a tea and social, the club has suspended operations during the summer months. A very satisfactory balance sheet was submitted to headquarters. Club roll: 30. *Secretary*: N. Tweddell, 103, Breamore Road, Seven Kings, Ilford.

St. Mary (Bourne) M.C.—An Exhibition of Hornby Trains and Meccano Models was given at the Church Fete on 17th June. Other seasonable activities include Cycling Trips, Sports Championship Meeting and Cricket Match, and Club Camp. Club roll: 20. *Secretary*: D. L. White, "Rosedale," Stoke, Nr. Andover, Hants.

Richmond (Surrey) M.C.—At a recent meeting a new committee was elected, a new secretary appointed, and the rules were overhauled and altered. No ordinary meetings will be held during August, but Cycle Trips have been arranged and the committee have decided upon a Club Day at the British Empire Exhibition. In connection with this interesting event a Savings Fund has been opened, members paying in as much as they like, and after payment of expenses the balance will be spent at the Exhibition. A Sports Meeting has been fixed for July 18th. The Cricket Team is doing better than last season and all four games played have been won. A Special Merit Medallion is to be presented to the club's former secretary, J. Viney, who did excellent work last winter. *Secretary*: Alfred R. White, 15, Albert Road, Richmond, Surrey.

Meccano Club Secretaries

No. 4. Miss K. R. Day

Miss Kathleen R. Day, Secretary of Blagdon St. Andrews Meccano Club, has the honour of being the first and only lady secretary of an affiliated Meccano Club. The success of the Blagdon Club is largely due to her enthusiasm and hard work, coupled with the valuable Leadership of Mr. F. C. Taylor. Miss Day has been secretary since the commencement of activities last winter.

The Blagdon Club has tried with great success the interesting experiment of running musical half-hours on model-building nights. Each member contributes weekly towards the purchase of a Meccano Outfit for the use of the club, and last session a prize was awarded to the member having the best record of attendance.

Harwich M.C.—The Prize Distribution and Concert was held on June 10th. Merit awards were presented on this occasion to W. Biles and W. Hatcher. J. Brooks is compiling a history of the club's successful career. Mr. Philip Whittingham, who has shown great interest in the various activities, has now been appointed Deputy Leader. Club roll: 34, average attendance 28. *Secretary*: A. E. W. Ward, Osborne House, Pepys Street, Harwich.

2nd Porthcawl M.C.—In order to ensure a good session next autumn, the secretary is anxious for all Meccano enthusiasts in the district to get into touch with him. During the summer the usual activities are suspended. *Secretary*: G. Morgan, "Glen Gower," 20, Park Avenue, Porthcawl.

South Africa

Durban M.C. (South Africa).—The Mayor of Durban has kindly presented badges and certificates to new members, and also recruiting and merit awards. The Club has been invited to organise a stall at a forthcoming Motor Trades Exhibition. The Motor Trades Association has offered a prize of £5 5 0 for the best original model to be judged by eight members of the Natal Institute of Engineers under the supervision of Prof. Neale, a Vice-President of the Meccano Club. Other gifts to the club include a Wireless Set from the Britannic Wireless Co., and a No. 4 Meccano Outfit from Messrs. Reynolds & Co. A silver cup, value £25, to be competed for annually, has been presented by Messrs. Harvey, Greenacre & Co., Durban. This trophy will be held for a year by the winner, but each year it will be accompanied by a silver replica in miniature which will become his own. The cup will be presented for Conduct, Hardwork, Sportsmanship, Attendance, and Comradeship. Club roll: 85. average attendance 88 per cent. *Secretary*: A. Altmann, Durban Meccano Club, Natal Technical College, South Africa.

Clubs not yet Affiliated

Oak Street (Accrington) M.C.—Is connected with Oak Street Congregational Church and owes much of its success to the practical assistance of the Rev. H. G. Newsham and the enthusiasm of the Leader, Mr. W. Little. During the summer the programme is largely of an outdoor nature. Club roll: 14, average attendance 12. *Secretary*: J. Duckworth, 57, Manchester Road, Accrington.

Saltney Ferry (Chester) M.C.—Has obtained the use of an excellent club room through the courtesy of the L.M.S. Railway Company. A Recruiting Campaign is being vigorously conducted under the Leadership of Mr. E. Rowlands, 37, Ewart Street, Saltney Ferry, Chester.

Queen Elizabeth's Grammar School (Crediton) M.C.—Has been well supported among the boys of the School, and now, with the practical help of Mr. T.H. Thompson, one of the masters, members are keen to have their club affiliated with the Guild. Club roll: 14, average attendance 12. *Secretary*: J. F. Clarke, Queen Elizabeth's Grammar School, Crediton.

Belturbet (Co. Cavan) M.C.—Has been started through the enthusiasm of the secretary, and the indications are that it will be quite a successful club. Club roll: 8. *Secretary*: J. Kennedy, 3, Railway Road, Belturbet, Ireland.

Marks Tey M.C.—Twelve members have been enrolled, and it is hoped shortly to obtain the use of a permanent headquarters. *Secretary*: Roy Brownsell, Oak House, London Road, Marks Tey, Essex.

Mossley (Manchester) M.C.—Membership continues to grow. Meetings are now held weekly and recently the club purchased a good Meccano outfit. A small weekly contribution is made and suffices to pay the rent of the club-room. Club roll: 11, average attendance 8. *Secretary*: J. Yates, 8, Woodbank Terrace, Mossley, nr. Manchester.

St. James (Leek) M.C.—Has now applied for affiliation. Members have installed electric lighting and heating appliances in the well-equipped club room at Consall Hall. The various activities include a successful Football Team and a First Aid Section. The Club Leader, Mr. A. S. Podmore, is an ex-officer of the Red Cross Society and is thus well qualified to organise this useful feature. Club roll: 20, average attendance 20. *Secretary*: W. Armstrong, 4, Gaunt Buildings, Derby Street, Leek.

Beverley Road I.M.M.C.—Has now succeeded in obtaining a good Leader in Mr. Tom Cooper. Regular meetings are held, and great interest is shown in Hornby Trains and Model Railway working. Club roll: 19. *Secretary*: H. Henshaw, 35, Kendal Road, Bolton, Lancs.

Siena (Italy) M.C.—Membership shows a steady increase. In addition to weekly meetings for Model-building, members have a Football Team, a Cricket Team, a Cycling Section, and a regular schedule of Gymnastics. *Secretary*: V. Bruchi, 39 Via Ricasoli, Siena, Tuscany, Italy.

Hipperholme Wesleyan M.C.—Continues to hold regular meetings and much enthusiasm is displayed. E. W. Rushforth has been appointed secretary and has changed his address to Laverock Lane, Brighouse, Yorkshire.

Darlington M.C.—Members are working hard in preparation for a forthcoming Concert and Exhibition of Models. The committee have a good syllabus drawn up, and in view of the Railway Centenary Celebrations this month at Darlington specially interesting reports are expected from members. Club roll: 12, average attendance 9. *Secretary*: A. G. Pankhurst, 90, Willow Road, Darlington.

Proposed Clubs

Cowes (Isle of Wight).—A vigorous attempt to found a Meccano Club is being made. The leading part is being taken by J. P. Bartlett, Moss Side, Park Road, Cowes, to whom all interested should make immediate application.

Anerley (London, S.E.20) M.C.—All Meccano boys residing in the district and wishing to join a club should communicate with D. S. Waite, 4, Elmers End Road, Anerley, London, S.E.20.

Beckenham (Kent) M.C.—It is hoped shortly to establish a Club in Beckenham, and all boys interested should get into touch with S. D. Steele, 49, Kingshall Road, Beckenham, Kent. A Leader and a club room are urgently required.

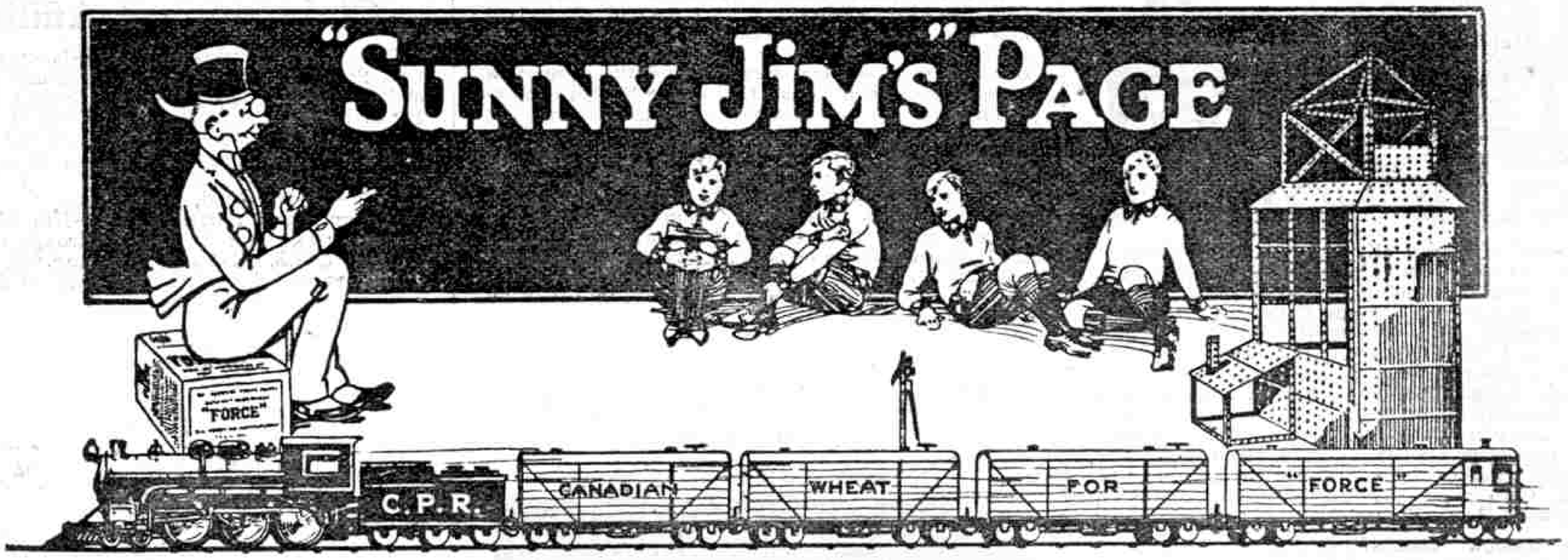
Trowbridge, Wilts.—It is proposed to form a Meccano Club in Trowbridge. A Leader and a room are urgently needed. Meccano boys interested please apply to N. Lillistone, 21, Park Street, Trowbridge.

Mayfield (New Zealand) M.C.—R. McIlraith of "Willowbank" Box 48, Mayfield, Ashburton, Canterbury, South Island, New Zealand, is endeavouring to form a club, and would be pleased to hear from any Meccano boy who would like to join.

Walsall (Staffs.) M.C.—Boys interested in Meccano and Wireless and wishing to form a club in Walsall are requested to communicate with G. Rogers, 43, Arundel Street, Caldmore, Walsall.

Rock Ferry (Cheshire) M.C.—S. Patterson, 39, Chatsworth Road, Rock Ferry, Cheshire, is endeavouring to form a club and wishes to hear from Meccano boys interested. An Adult Leader and club room are urgently needed.

Poulton-le-Fylde M.C.—Great efforts are being made by E. Watson, Gwaenyscor, Poulton-le-Fylde, assisted by his friends, to form a club. There are great hopes of obtaining an adult Leader and club room very soon.



LET'S GO KITE FLYING WITH SUNNY JIM

Kites! Holidays! "FORCE" and cold milk for breakfast. Kite flying on the common. "FORCE" and fruit at lunch. Kite flying in the park. "FORCE" and hot milk for supper. Plans for more kite flying as we drop off to sleep.

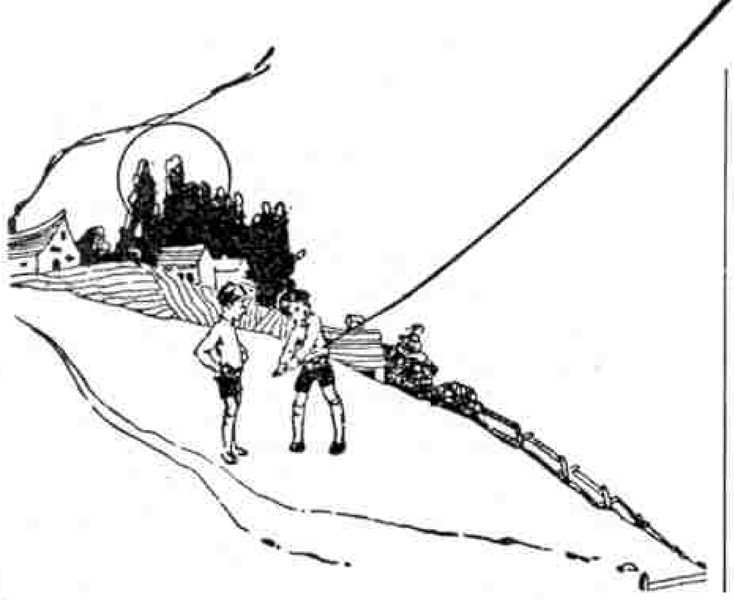
Yes, kite flying can be just as interesting as that, if you set out to make the most of this exciting pastime.

There's something wonderfully fascinating about a kite. All over the world boys have keenly enjoyed the tests of skill that come in the dexterous manipulation of the tugging kite line. Not anyone can fly a kite—properly. Its an art to be learned with patience.

You, perhaps, are already an adept, but if not, learn now the fun there is in this jolly pastime. You'll find it far more interesting than you ever thought. If you want a new kite at a bargain price send to me for the "Sunny Jim" kite (Follow directions given at foot of page). My picture in colours is on every kite. The "Sunny Jim" kite is 28 ins. high and 23 ins. broad and shaped as you see it in the picture.

With this kite and a good ball of twine you are equipped with everything you need. You have only to find a favourable wind.

Start on a day with a moderate breeze—not too strong, not too light, certainly not gusty.



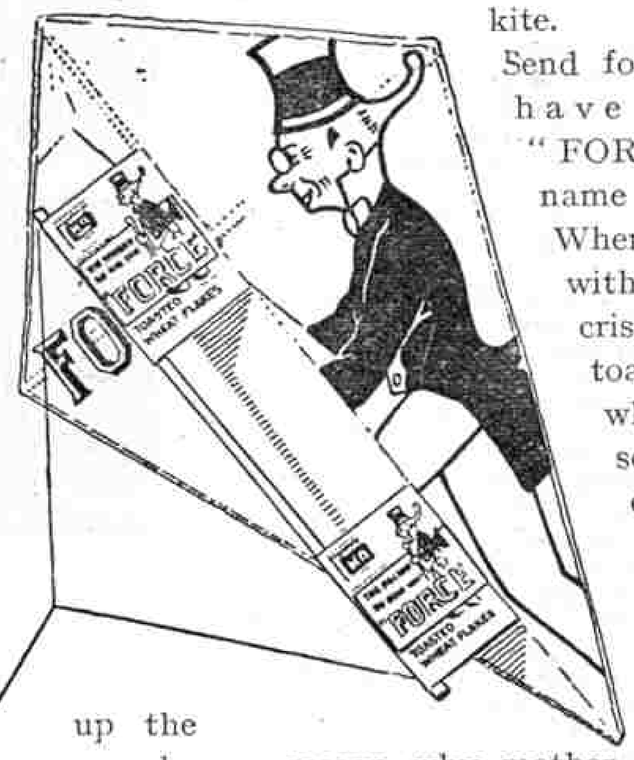
Adjust the balance of the kite by varying the position of contact between the line and the kite loop. Beware of letting out too much line at once. Gradually is the better way. As the kite rises to the greatest height the line allows, pay out more line, checking evenly as you do so to prevent the kite from losing height.

Soon you will have attained a good altitude and will be in readiness to run some paper windmills up the line. If they are fixed properly the wind will steadily carry them right to the top.

If your friend has a "Sunny Jim" kite too you can have contests with these "line riders" and enjoy the thrill of many an exciting finish.

Kite flying has long been popular with boys in Japan. They have developed the game until it is a fine art. They have contests too, but of a different nature from those that interest us. When one Japanese boy challenges another, it is for a duel. Each manœuvres his kite until he has his line crossing the other's in mid air. One then "saws" against his opponent's line until victory is won by the breaking asunder of one of the lines. The losing kite is usually recovered, though often only after a long run as the loser follows its erratic descent.

Simple contests as to whose kite can fly the highest or remain in the air longest without "crashing" will come first to mind, while an enterprising Meccano boy will soon devise lots of other interesting things to do with his "Sunny Jim" kite.



Send for one now. If you have never tasted "FORCE" send your name for a free sample. When you try "FORCE" with milk or fruit the crisp crunchy flakes of toasted and malted whole wheat will soon make you decide to ask for the full size packet which costs 9½d. "FORCE" needs no cooking at all. That's another reason why mother will be glad to buy it for you!

"FORCE" is that easy to serve, you could, without any trouble at all, get your *own* breakfast. Any Meccano boy can shake "FORCE" flakes from the "FORCE" packet. Any Meccano boy can help himself to milk or to tinned or stewed fruit. And of *course*, any Meccano boy can eat this most delicious of all dishes. He wouldn't want much persuading!! Neither would you! Not only is "FORCE" nice to eat but it is the food to build healthy strong bodies and keen alert minds.

Eat "FORCE" *every* day.

Your friend,

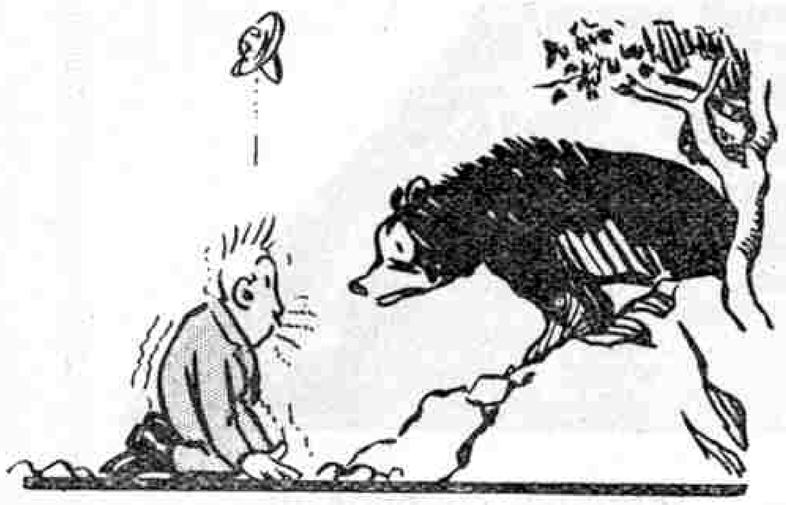
Sunny Jim

How to get the "Sunny Jim" Kite

Save the tops from two packets of "FORCE." Buy a 1/- postal order from the post office. Put the two "FORCE" packet tops, the shilling postal order, and your name and address in an envelope, marked "KITE" in the top left hand corner, and post to Sunny Jim, 197, Gt. Portland Street, London, W.1.

Fireside Fun

KEEPING COOL



Jim : " Did your brother keep cool when he met the bear ? "

Joe : " Cool ! He was so cool that his teeth chattered."

* * * *

Little Tommy was eating an enormous tea at the Sunday School treat and the Vicar's wife was becoming really alarmed. " My dear lad," she expostulated, " you really must not eat any more or you'll be ill. You're too small to eat so much."

" Well mum," replied Tommy, " I'm not so small inside as I am outside ! "

* * * *

NOT A PERMANENT CURE

Customer (to grocer) : " That ham I bought from you is not good."

Grocer : " It can't be bad, it was only cured last week."

Customer : " Well, it may have been cured last week, but I reckon it's had a relapse since."

* * * *

Doctor : " Did you follow my advice to count until you fell asleep ? "

Patient : " I counted up to 18,000."

Doctor : " And then you fell asleep ? "

Patient : " No, it was time to get up ! "

* * * *

At one corner of a block of shops in a certain American city a restaurant put up the illuminated sign, " Never Closed." Following this example a large drug store at the other corner put up the sign, " Open all Night."

In the middle of the block Wu Ting Ling had his small laundry. Not to be outdone by his big neighbours he also hung out an illuminated sign. It read, " Me wakee too."

* * * *

Q. If a cannibal eats his father's sister, what is he ?

A. An ant-eater of course.

This Month's Short Story

Mary had a little lamb,
You've heard this tale before.
But have you heard
She passed her plate
And had a little more ?

* * * *

Bobby : " Mother, what are twins ? "

Sister Margery (interrupting) : " I know. Twins are two babies just the same age ; three are triplets ; four are quadrupeds and five are centipedes."

* * * *

First Farmer : " What did you give your horse when he got the glanders ? "

Second Farmer : " Turpentine."

Six months later they met again.

First Farmer : " What did you say you gave your horse when he got the glanders ? "

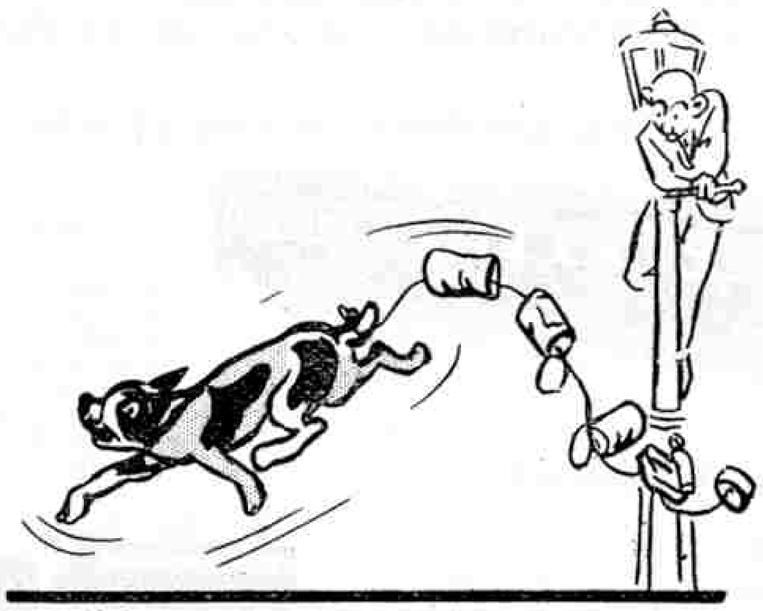
Second Farmer : " Turpentine."

First Farmer : " Well, I gave my horse turpentine and he died."

Second Farmer : " So did mine ! "

* * * *

BROADCASTING !



" What did the poor little dog do when you bad boys tied the cans to his tail ? "

" Oh, he just went broadcasting down the street."

* * * *

Tom : " Bill, you want to keep your eyes open around here to-day."

Bill : " What for ? "

Tom : " Because people will think you're crazy if you go about with them shut ! "

* * * *

Old Man (wandering round book shop) : " Let me see, ' Last Days of Pompei '— what did he die of ? "

Book Seller : " Some sort of eruption I believe."

* * * *

She : " Why does the car squeak so dreadfully ? "

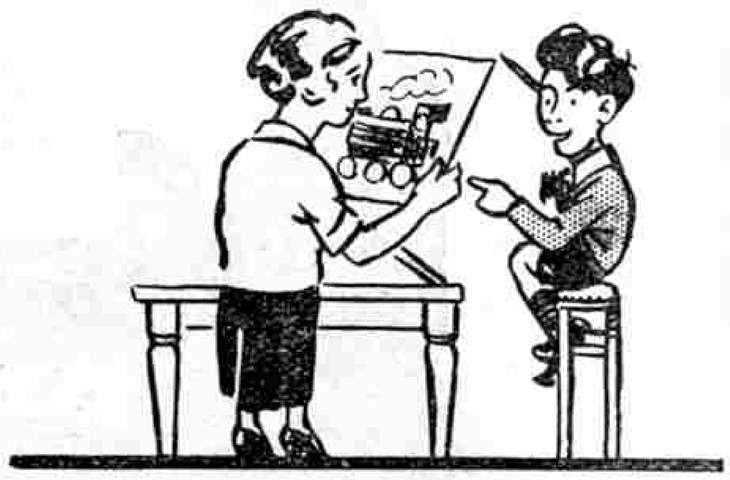
He : " Its the pig iron in the axles."

* * * *

Charlie : " Frank boasts that no man living could forge his name to a cheque and get it cashed. Has he a very peculiar signature ? "

George : " No, but he hasn't any money in the bank."

QUITE SO !



Mother : " What is this supposed to be, my son ? "

Son : " A train, mother."

Mother : " But you haven't drawn any carriages."

Son : " Oh no, mother. The engine draws them ! "

* * * *

A man rushed into a restaurant. " I want two good eggs," he said, " and I want them bad."

* * * *

Dobson : " At least once in my life I was glad to be down and out."

Robson : " When was that ? "

Dobson : " After my first trip in an aeroplane."

* * * *

Teacher : " Dear me, Jacky, how dirty you are ! What would you say if I came to school as dirty as that ? "

Jacky : " Please sir, I'd be too polite to mention it ! "

* * * *

One good turn deserves another. That's why our cat turns round three times before lying down.

* * * *

RULES FOR HOTEL GUESTS

1. Guests are requested not to speak to the dumb waiter.
2. Guests wishing to get up in the morning without being called may have self-raising flour for supper.
3. Guests wishing to do a little driving will find a hammer and nails in the cupboard.
4. If the room gets too warm, open the door and watch the fire escape.
5. If you are fond of jumping, lift the mattress and watch the bed spring.
6. If your lamp goes out take a feather out of the pillow. That's light enough for any room.
7. Anyone troubled with nightmare will find a halter on the bedpost.
8. Don't worry about paying your bill, this house is supported by the foundations.

* * * *

Q. When does a hen take matters most seriously ?

A. When she's in 'er nest.

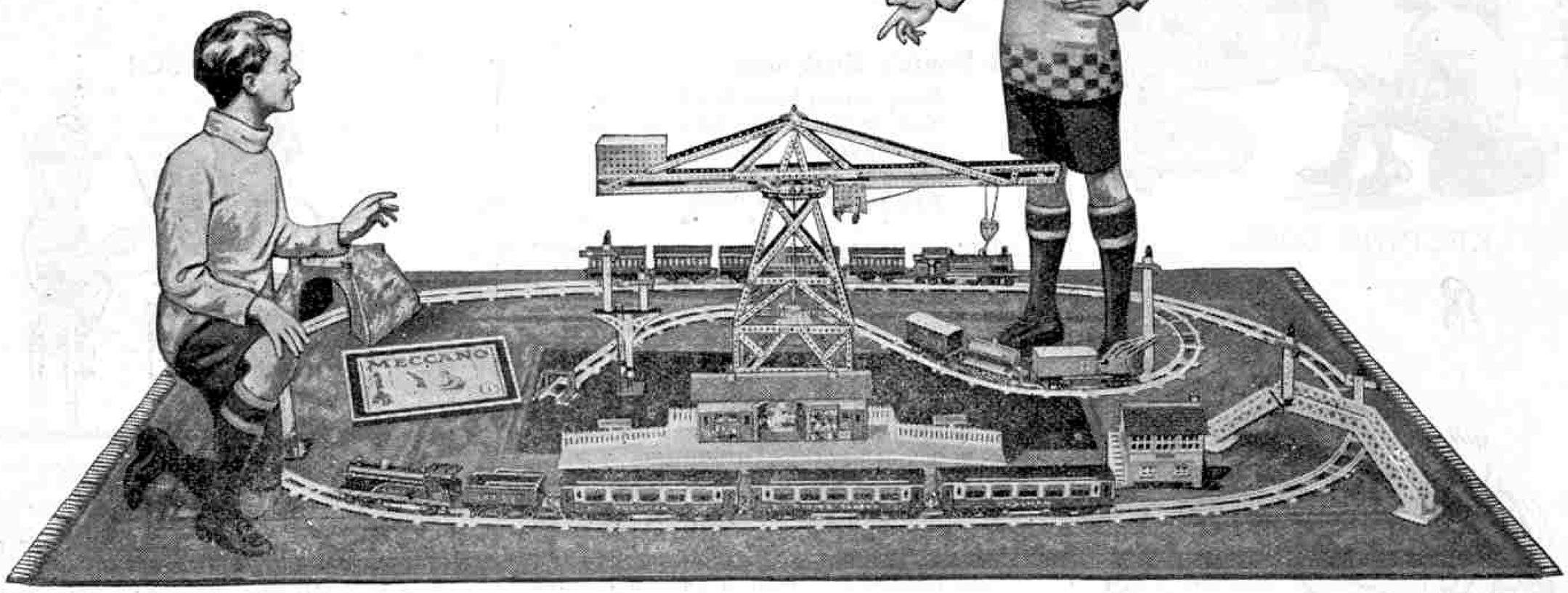
* * * *

Jim : " Can you stand on your head ? "

Joe : " No, it is too high up."

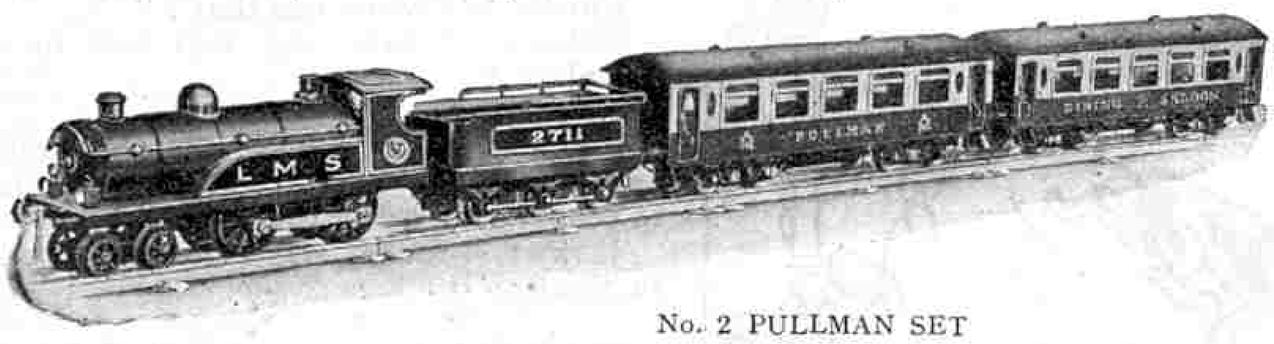
HORNBY CLOCK WORK TRAINS

THE TRAINS
WITH THE
GUARANTEE



YOU can have any amount of fun playing with a Hornby Train. Shunting, coupling-up the rolling stock and making up trains will give you hours of pleasure. Hornby Trains are beautifully finished, strongly made, and will last for ever. One of their most valuable features is that all the parts are standardised, and any lost or damaged part may be replaced with a new one.

Every train is guaranteed, and you are therefore sure of satisfaction if you buy a Hornby.



No. 2 PULLMAN SET

No. 2 Pullman Set

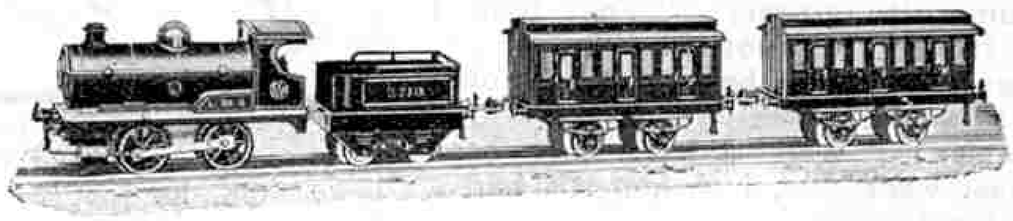
The No. 2 Loco with Tender measures 17 in. in length. The Loco is fitted with superior mechanism and the accurately-cut gears ensure smooth running. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colours and stoved at a high temperature to ensure durability. The Loco is fitted with reversing gear, brake and governor.

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender and two Coaches, with set of rails to form a circle of 4 ft. diameter. Price 60/–.

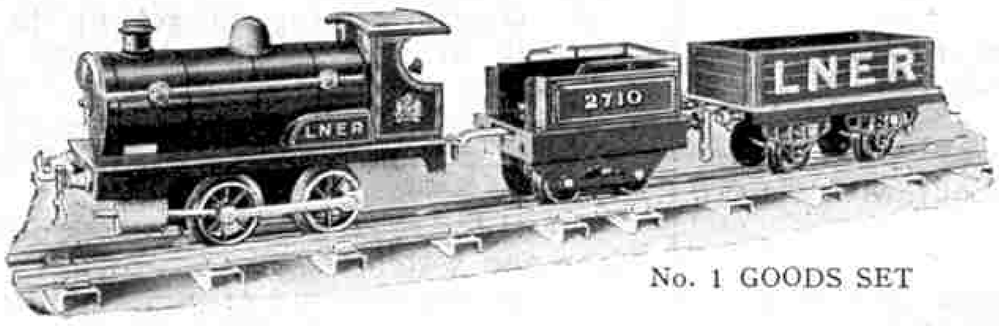
No. 1 Passenger Set

The Loco is fitted with reversing gear, brake and governor. Loco, Tender and Coaches are superb in appearance and finish, enamelled in colour and stoved at a high temperature to ensure durability. The doors of the Coaches open.

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each set contains Loco, Tender, two passenger coaches and set of rails consisting of two straights and curves to form a circle of 2 ft. diameter. Price 30/–



No. 1 PASSENGER SET



No. 1 GOODS SET

No. 1 Goods Set

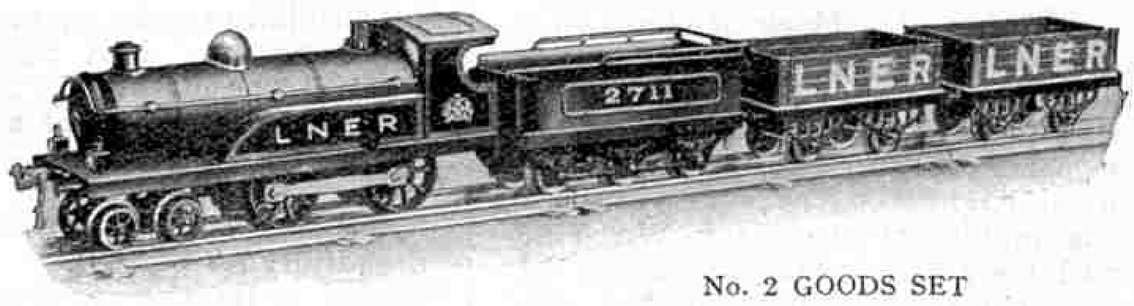
Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling-stock. Each Loco is fitted with reversing gear, brake and governor. Each set comprises Loco, Tender, one Wagon, and set of rails as in the No. 1 Passenger Set. Price 22/6

No. 1 Hornby Loco	Price 15/–	Hornby Passenger Coach	Price 5/–
,, ,, Tender	,, 2/6	No. 1 Hornby Wagon	,, 2/6

No. 2 Goods Set

Gauge 0 in colours to represent the L.M.S. or L.N.E.R. Companies' rolling stock. This set contains Loco, Tender and Rails as in the No. 2 Pullman Set, and two Wagons. Loco fitted with reversing gear, brake and governor. Price 37/6

No. 2 Hornby Loco ...	Price 22/6	Hornby Pullman or Dining Car ...	Price 15/–
,, ,, Tender	,, 3/6	No. 2 Hornby Wagon	,, 2/6



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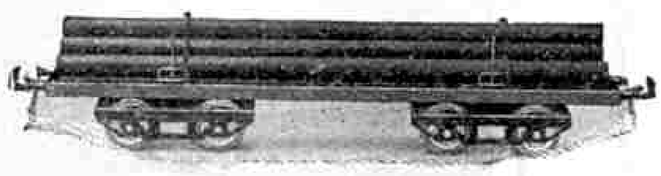

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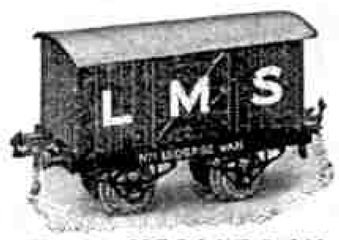

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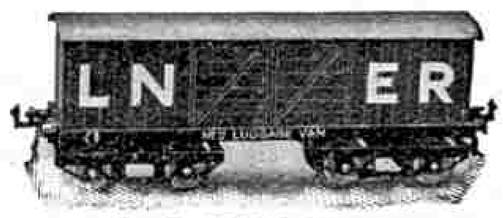

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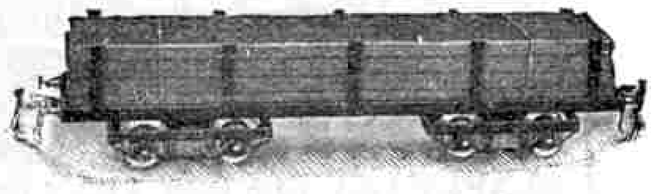

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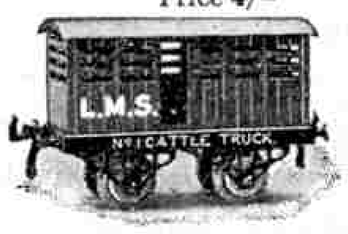

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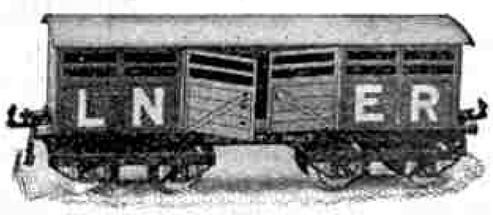

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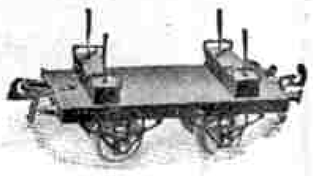

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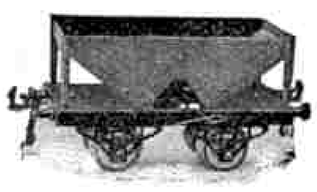

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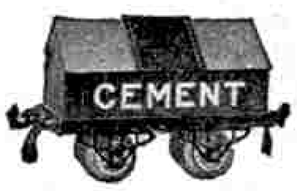

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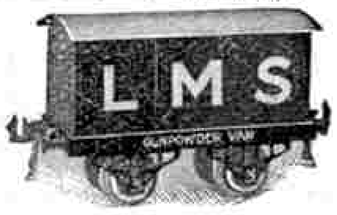

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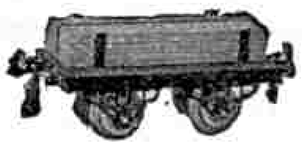

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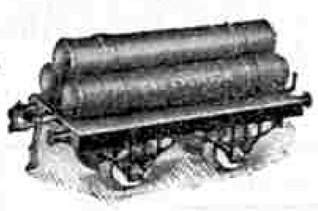

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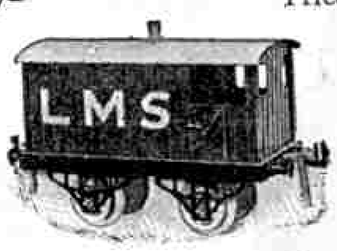

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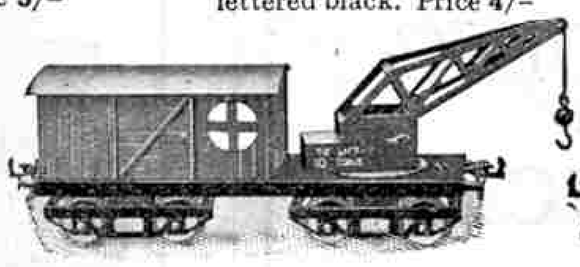

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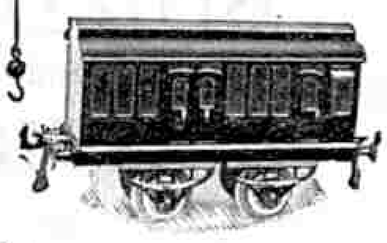

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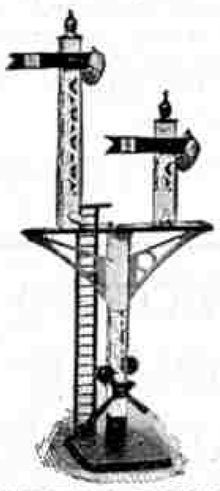

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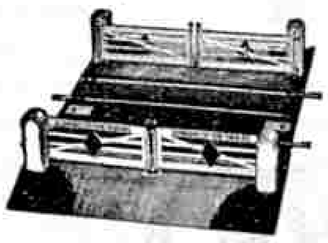

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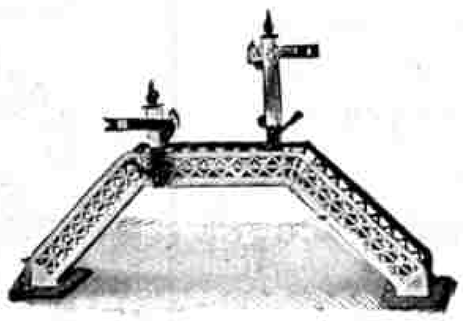

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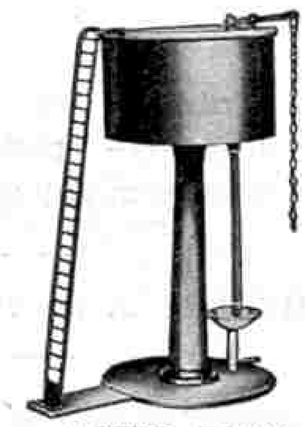

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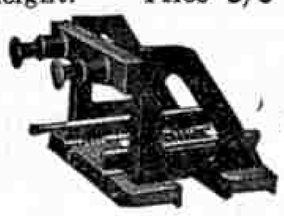

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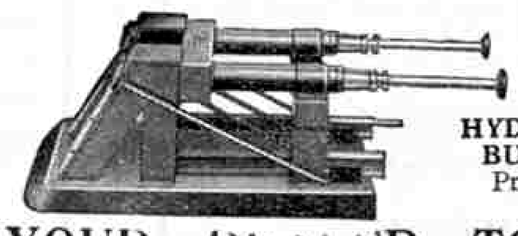

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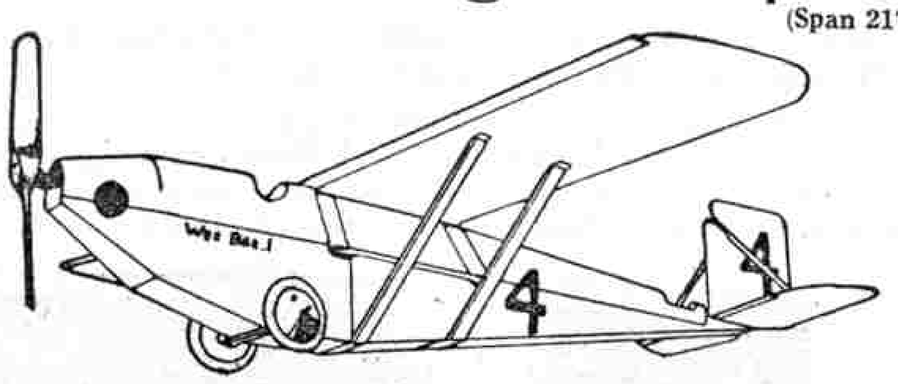

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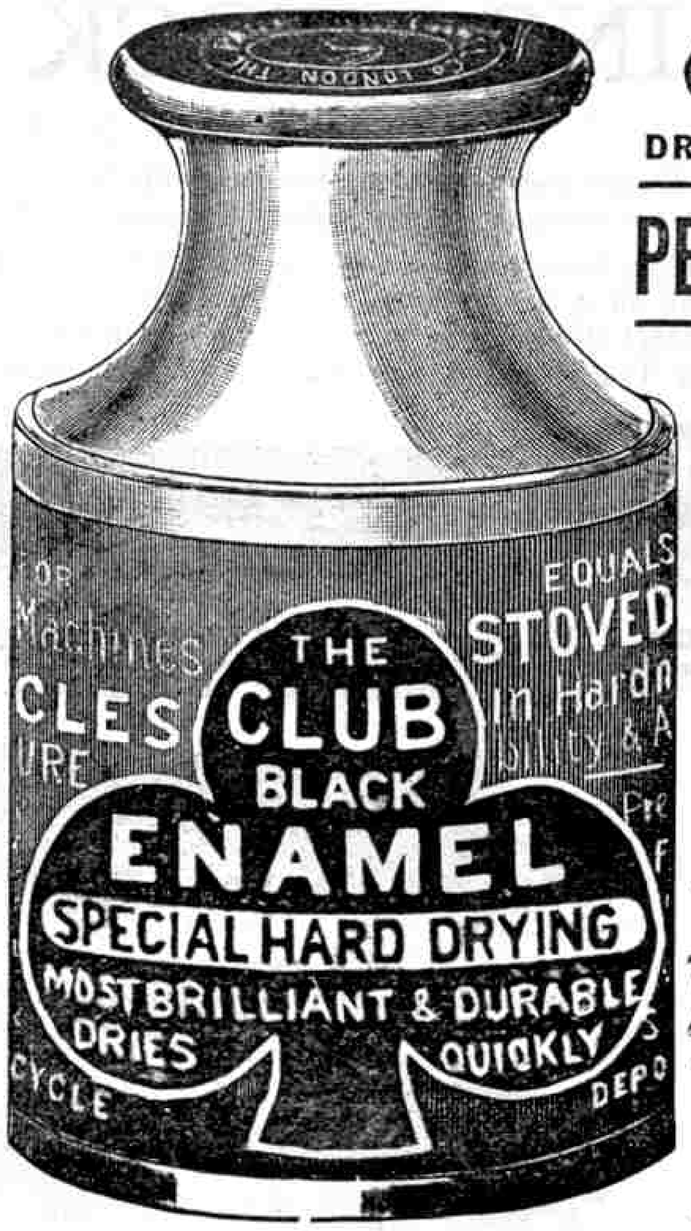

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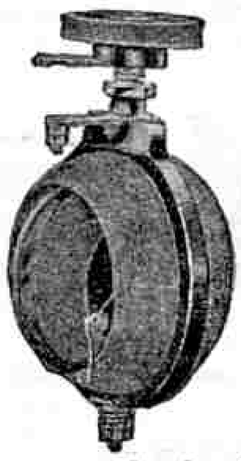

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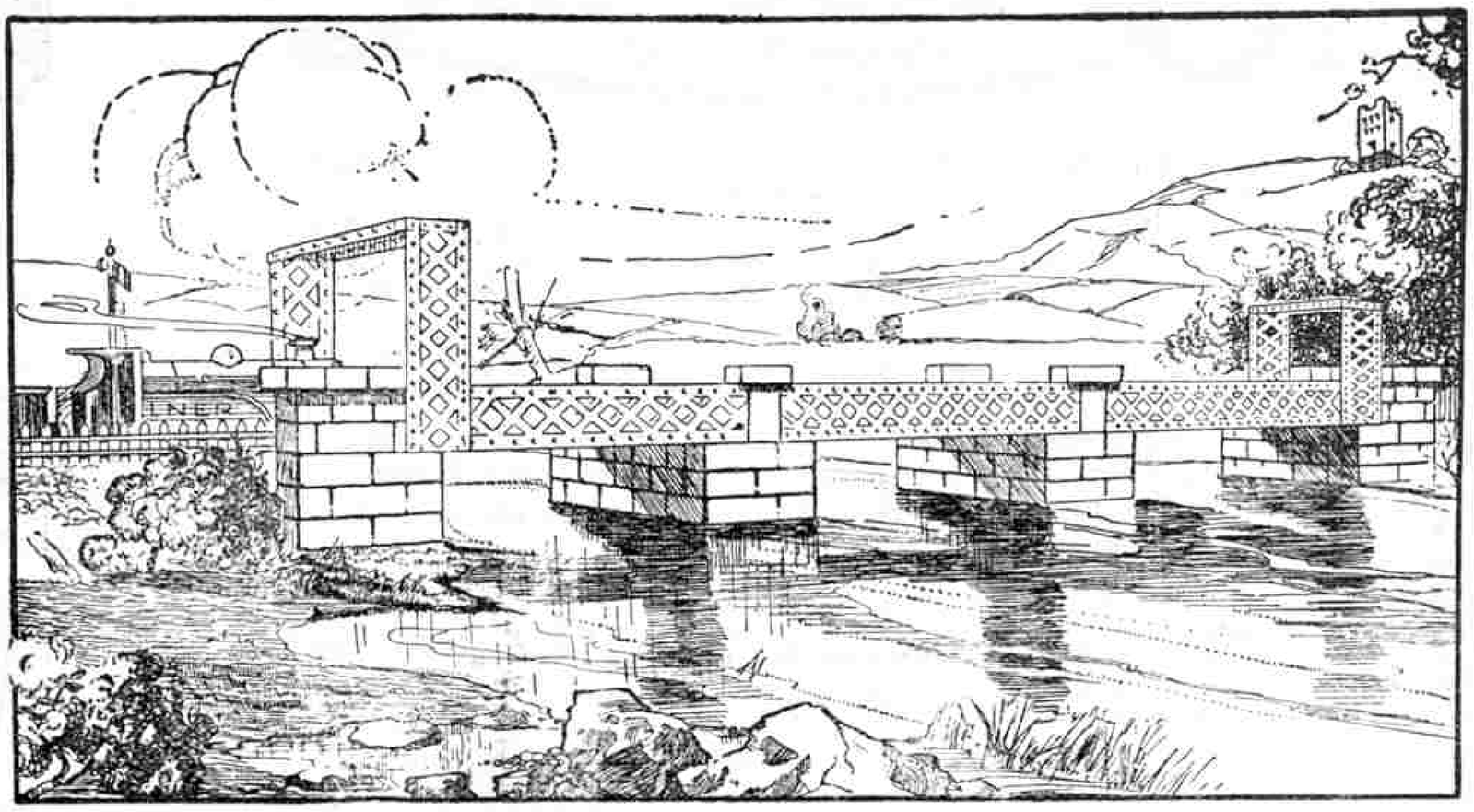

A three span Girder Bridge constructed with stone bricks, girder and angle strips.

The bridge illustrated measures 3 ft. 3 in. in length, and can be adapted to carry one or more tracks of "O" gauge rails.

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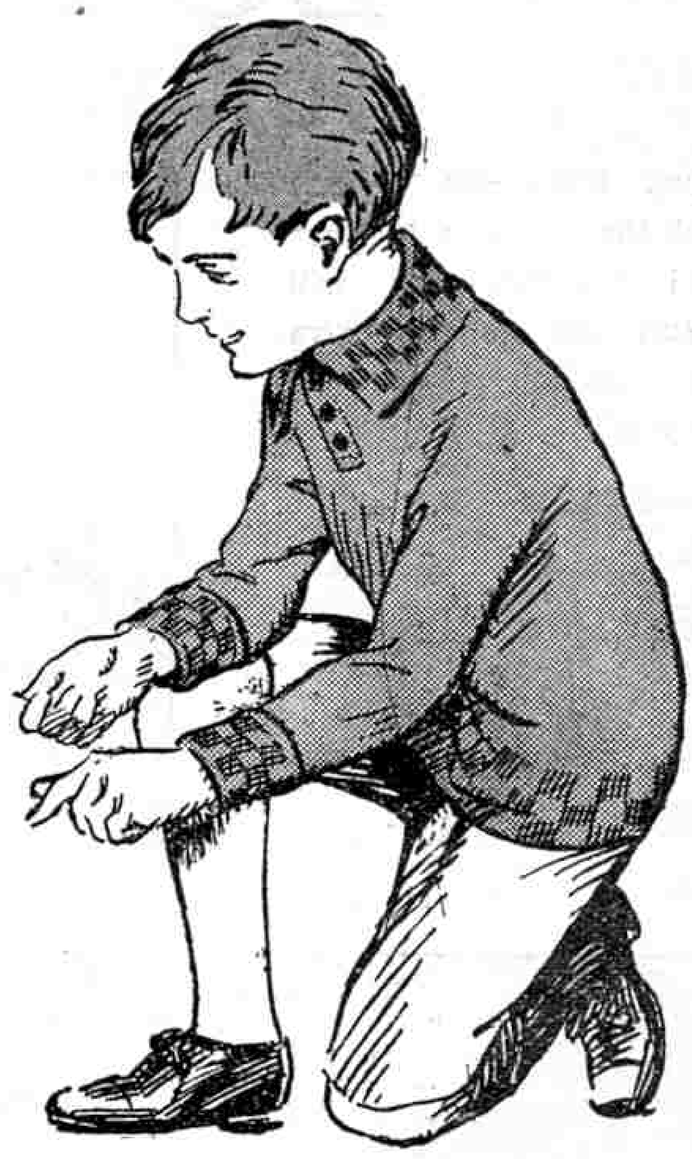

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Fine Weather, Fine Roads, & Fine Quality Skates at the lowest prices in the trade, have all combined to create a **record demand** for **ROLLER SKATES.**

They provide **ideal outdoor exercise** for growing **boys** and **girls**, and to use the words of one of our delighted customers,

"They are a joy to own and a pleasure to use."

No. 3 with Threaded Clamps and Case-hardened Steel Wheels are only **5/-** pair
No. 5 with best Ball-bearing Wheels, **10/-** ,,
No. 6 ,, and Block Heels, as illustrated **11/-** ,,
Postage and Packing 9d. pair extra.

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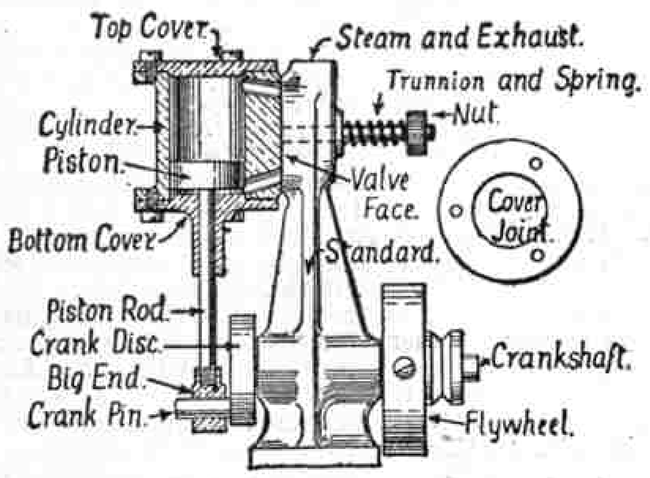

"Thank you for sending the S.T. Boiler. The engine, bought at Wembley, was soon coupled up and ran perfectly. My little boy was so pleased to see that it was powerful enough to drive a Meccano Crane."

Thus writes a customer. Above is the drawing sent with the instructions for building and we *guarantee* the engine will work.

S.T. Engine Parts ... 5/- } *Post*
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Send stamp for list 12M or 6d. for complete 80-page catalogue.

Stuart Turner Ltd.

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THE AUTOMATIC PEA REPEATER

The most reliable pistol on the market. Takes 25 shots at one loading, best black finish, each in box with instructions and supply of ammunition, post free 2/6.

New model 17-shot Pea Repeater, black finish, post free 1/3.

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Be sure and read

"ELECTRICITY"

every Friday. TWOPENCE.

A helpful serial on the mathematics of Wireless will appear during the summer.

ASK YOUR NEWSAGENT FOR IT.

MODELSHIPS' FITTINGS

Send 6d. for Scale Drawing of Splendid Ocean Liner and List of Realistic Fittings. **A. Rodway, 102, Long Street, Birmingham.**

POSTAL TUITION IN BOOK-KEEPING, FRENCH, SPANISH, COMMERCIAL LAW, Etc., WITH OR WITHOUT EXAMINATIONS IN VIEW; also all Subjects for MATRICULATION, UNIVERSITY DEGREES, SECRETARIAL AND ACCOUNTANCY EXAMINATIONS. Nominal Fees. Instalments Accepted. Distance no Drawback. Applicants should mention Subjects required. Prospectus Post Free.

The Principal, TUTORIAL SERVICE COLLEGE,
183, Fulham Palace Road, Hammersmith, W.6.

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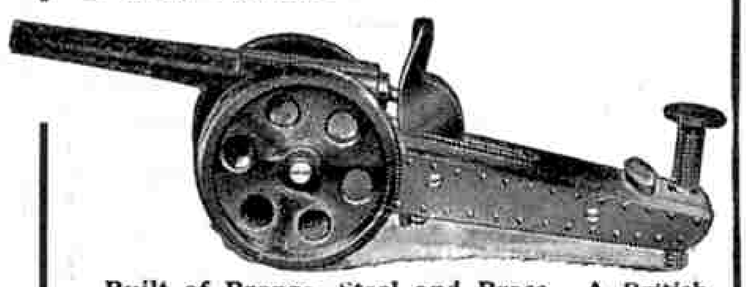
75 Shots cost 1½d.

7½ in. long.

This ingenious toy uses a Swan Vesta for ammunition which is secured in a charge chamber, thereby rendering the toy safe.

Effective with toy soldiers or target shooting. Can be seen and tried at our stand, Palace of Industry, Wembley.



Built of Bronze, Steel and Brass. A British toy, an engineering job. Spare parts obtainable.

4/9 post free.

Money returned if not approved. Trade inquiries invited.

HANWELL'S TOYS,
38, Alexandra Road, NORTHAMPTON

SPECIAL OFFER OF BLOW-LAMPS.

Strongly made, size 4×3¼. Gives powerful flame, removes paint, etc., solders without iron. Simple, safe, economical. Worth 3/6. Satisfaction guaranteed or money back. 1/6 each, 3 for 4/-, post free.

POST FREE **1/6**

WILKINSON & SON,
24, North Road, Clapham, S.W.

BATESON'S BLACKPOOL BARGAINS

Butcher's Famous **Plate** and **Film Cameras** at **Half Price.**

17/6 **Midget** ¼ Plate ... ... for **8/9**
18/6 No. 3 **Maxim** Film Camera ... ,, **9/3**
31/6 **Cameo** ¼ Plate ... ... ,, **15/9**
27/6 **Carbine** Film Lukos Shutter ,, **13/9**
55/- **Carbine** Film **Aldis Anistigmat Lens** ,, **27/6**
60/- **Cameo** ¼ Plate **Lukos** Shutter ,, **30/-**
62/6 **Panel** Carbine ... ... ,, **31/3**
87/6 **Carbine** Film **Beck** Symmetrical **Lens** ... ... ,, **43/9**
105/- **Vest Pocket Cameo** with either **Rapid Aplanar** or **Beck Symmetrical** Lens for **52/6**
£6 **Popular Carbine** with **Aldis** Lens ,, **£3**

Send at once as there is only one Camera of each kind.

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BLACKPOOL

JUST THE CAMERA YOU NEED FOR 1/-. Box Cameras 2½×3½×4½. Photos 2¼×3¼. A Camera complete with Plate, Printing Paper, Developing and Fixing Salts, 1/3 post free.—Max Wilson (Dept. M.M.), 85, Northgate, Wakefield, Yorkshire.

MAKE YOUR OWN

ELECTRIC LIGHT

These marvellous Dynamos light brilliantly 4-6 volt Lamps, and are very easy to work. List Free. Send for one now!

5/6 (Abroad 1/6)

GREENS (Dept. N.), 65, Long Acre, London, W.C.2.

BE TALLER!

Results Speak for Themselves.

THE ROSS SYSTEM OF HEIGHT INCREASE

Has increased my own height to 6 ft. 3¾ ins.

FIRST IN 1907. FIRST TO-DAY.

No appliances, no drugs, no dieting.

ROSS SYSTEM NEVER FAILS.

Fee :—**ONE GUINEA** complete.

A Client, aged 37, reports: "I have increased my height nearly an inch, and I have not been a full month yet!"

A Lady writes (after 5 weeks): "I have grown two inches, and feel much better. Thanking you for your Treatment, which I found a wonderful success."

Further particulars, if desired, 1½d. stamp.

THE GENUINE SYSTEM.

(N.) Malcolm Ross, Height Specialist 40, Victoria Rd., Scarborough, Eng.

HOBBIES LTD.

FAMOUS STEAM LAUNCHES

Peter Pan	22¾"	long ...	9/6
Miss America	31"	,, ...	12/6
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Pioneer	34½"	,, ...	30/-

BASSETT LOWKE LTD.

Dixie, clockwork or steam ...	25/-
Revenue cutter	35/-
T.B.D., clockwork or steam ...	50/-

Special Offer.

SAILING BOATS

Long	15½"	17½"	19"	21"	23"
	2/9	4/11	6/6	8/6	10/9

RACING YACHTS

Long	18"	21"	23"	26"
	19/6	23/-	25/-	27/6

Postage 9d. extra. Price List Free.
Money returned if not approved.

Everything in Ship's Fittings.

Wonderful Bargains in Wireless. List Free.

C. LUCAS

(Hobbies Famous Depot)

35, MANCHESTER STREET, LIVERPOOL.

1/6 THE BULLY BOY 1/6

The Pea Pistol you have been looking for! 20-Shot Repeater. Perfect action; fires a pea 25 feet; bright nickel finish; each in box with Ammunition. A better Shooter than you have ever had before. Send **1/6** and don't miss our latest and best pistol.

Foreign and Colonial postage 9d. extra.

J. Bishop & Co., 41, Finsbury Square, London, E.C.

BOYS MAKE YOUR OWN LEAD SOLDIERS.

Cowboys, Indians, Animals, Zulus, Model Station Staff, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE. Send stamp to-day for illustrated catalogue.

Complete mould ready for work 2/6

RODWAY, 102, Long St., Birmingham

Mention "Meccano."

Readers' Sales and Wants

If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/- (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

IMPORTANT.—Advertisements dealing with any article in the Meccano catalogue cannot be accepted.

SMALL ADVERTISEMENTS

(*Rate:* 1/- *per line*).

Old Coins. Guaranteed unsorted. Six for 1/9 post free.—Dutton, 14, Downend Road, Fishponds, Bristol.

CINEMA FILMS, 100 ft. 1/–, 1,000 ft. 6/–, delivered.—Phillips, 64, Ewart Street, Brighton.

Patents, Trade Marks, Inventions. Advice Handbook and Consultations free.—B. T. King, Regd. Patent Agent, 146a, Qn. Victoria St., London, E.C.4.

Entomology. British and Exotic Ovae, Larvae, and Pupae; Living Curious Stick Insects, etc. Lists Stamp.—Rose, 15, East Street, Tonbridge, Kent.

WRIST WATCH. Reliable. Choice shape (special, before Budget increase). 9/3 post free. Satisfaction, or money back.–Austin, Jeweller, 19, Park Row, Bristol.

THE WIRELESS INSTITUTE holds examinations and awards certificates and medals to wireless amateurs. Write—Dept. M, 74, Hendford, Yeovil.

Entomology. Curious Living Stick Insects, interesting, perfectly harmless. Small Insects, 9d.; Medium, 2/–; Adult, 6d. each, Post 4d.—Rose, 15, East St., Tonbridge.

MAIL ORDER ADVERTISING, for 7/10 inclusive. Sell your goods to eager provincial buyers through 56 influential newspapers. Prospectus: Central Press, (Series Dept. 55), 190, Strand, London, W.C.2.

WIRELESS. Phone blocks, 3/– (take 4 pairs),; Phones, 9/–; 48 spike formers, 1/6; Basket Plugs, 11d.; Rheostats, 1/6; Microstat, 2/9; "Igranic," "Lissen," "Burndept," etc., supplied. Orders of 5/6 post free. Send your enquiries to—J. W. Metcalf, Thornton Dale, Yorks.

Snakes, 1/9, 2/3. Lizards, 9d., 1/–. Postage 6d. Living larvae. Lists free.—Heath, 51, Woodville Road, King's Heath, Birmingham.

READERS' SALES

(*Rate:* 1*d. per word. min.* 1/-).

Fretwork Designs and Music, 12/6. Cost 15/6.—F. Suffield, Kilburn, York.

Handicrafts Fretwork Set, new at Christmas, cost £1. Will sell for 15/–. Been used once.—L. Bayliss, Rose Cottage, Crich, nr. Matlock, Derbyshire.

672 Cigarette Cards, threepence dozen. Splendid value.—William Johnston, Stoneshiel, Reston, Berwickshire.

754 Cigarette Cards, clean, 10/–.—Box No. 507.

1914 perfectly clean Stamp Catalogue, 2/–. Bassett-Lowke Tank Steam Loco, nearly new, gauge 0, 1¼ in., cost £2/15/–. For £1/15/– entertained.—Finch, Firth Hill House, Farncombe, Surrey.

Money easily earned by selling Rubber Stamps, in spare or full time. Particulars Free.—Richfords Ltd., Snowhill, London.

For Sale. Cigarette Cards, 2/– 100.—Tackaberry, 46, Reuben Street, Rialto, Dublin.

"Nil" packet containing assorted different, dirt cheap for (blank P.O.) 1/8 post free.—Chand Kishen, Montgomery, India.

Exchange Stamps. Your country for mine or any.—Master Price, Castle Square, Morpeth, Northumberland, England.

Stamps, 25 N.Z. and Australian 1/–.—F. Ware, Riverslea Road, Hastings, New Zealand.

CUT THIS OUT. **'Meccano' Pen Coupon, Value 3d.**

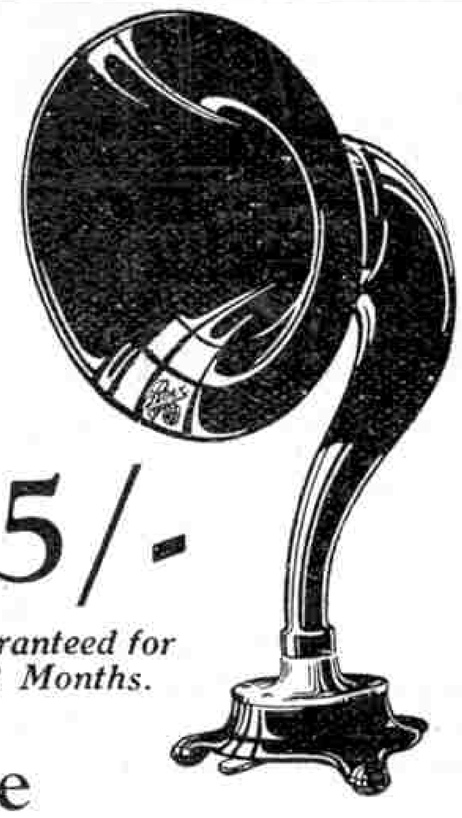
Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C.4.** You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.) Satisfaction guaranteed. Your own name gilt letters, either pen 1/– extra. **Lever Self-Filling Model with Safety Cap, 2/– extra.**

Eswey Watches

Gent.'s Solid Nickel Silver Pocket Watches.
THE "BRITON" LEVER.
Interchangeable Keyless Movement. Smart Dustproof Cases.
The only Watch with a guaranteed Main Spring.
2 Years' written warranty.
Satisfaction or cash refunded after 7 days' trial.
ESWEY WATCH CO., 17, Cobbett Road, London, S.E.9. 7/6 Post Free.

TWO GOOD PEA PISTOLS AT LAST

No. 1. New 15 Shot Pea Repeater, brightly nickelled ... **1/6** post free
No. 2. 25 Shot Pea Repeater, heavy model, black finish ... **2/6** post free
Each Pistol is **Guaranteed Perfect.**
Instructions, and a supply of ammunition with each one.
Postal Orders or 1½d. stamps accepted.
HERBERTS', 27, Adys Road, Peckham, London, S.E.15.



25/-

Guaranteed for 12 Months.

The Baby Loud Speaker with the Grown-up Voice

In this little fellow you get mellow, pure, undistorted reproduction—no shrillness, no overtones—just crystal clear broadcast. 12½ ins. high. Bell, 7 ins. diameter. Handsome crystalline finish. At all reputed Dealers. If unable to obtain, write direct.

The CABLE ACCESSORIES CO. LTD., Tividale, Tipton, Staffs.

"Revo"

"The Name for Perfect Radio"

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICES:—
BINNS ROAD, LIVERPOOL.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 3d. per copy. It will be mailed direct from this office, 2/– for six issues and 4/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published. Whilst every care will be taken of those submitted, the Editor does not accept responsibility for any loss or damage. A stamped addressed envelope should be sent where the contribution is to be returned if unacceptable.

Binding Cases. Spring-back Binders to take a number of "*M.M.'s*" are supplied, covered with imitation leather and lettered in gold, price 3/– each (post free).

Meccano Writing Pads. Fifty sheets of tinted bank paper, each printed with Meccano boy at head, 1/– (post free) large size, and 6d. (post free) smaller size.

Advertisements

Readers' Sales and Wants. Private advertisements (*i.e.*, not trade) are charged 1d. per word, minimum 1/–. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/– per line (average seven words to the line), or 10/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest circulation figures, will be sent on request.

Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher Copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 4d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 3d. per copy, or mailed (post free) direct from Liverpool, 2/– for six issues, or 4/– for twelve issues.

IMPORTANT

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA: Meccano Ltd., 45, Colborne Street, Toronto.
AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Messrs. Browning Ifwersen Ltd., P.O. Box 129, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

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Crowded Hours of Happiness for all the Children

The PEDAL FAIRYKAR

Regd. Trade Mark

Baby will love this Pedal Fairykar. There is nothing to beat it. It is beautifully painted a bright red with nickel-plated handle bar and stem, rubber pedals, etc. A splendid health-giving toy.

No. 4 as illustrated 15/-
No. 5 larger size with spider wheels 22/6

The Fairycycle

If only you had a FAIRYCYCLE just think what fun you could have, and what splendid exercise you would get in riding it.

The FAIRYCYCLE is a real Cycle—not a make-believe. It is beautifully constructed, runs with remarkable ease, and is SAFE because the low riding position makes it easy to control. And it is BRITISH. Price now reduced to 49/6. . . . **49/6**

The De Luxe Fairycycle

Specification includes $\frac{7}{8}$" white ribbed cushion tyres, ball bearing tangent spoke wheels and rim brake.

Price only **61/6**

LINES BROS. ENGLAND

Look for the Triangle Trade Mark on all these toys

The COMET MOTOR CAR

This natty little racing model is the very thing for the youngsters. It is built for sturdy boys and girls, and will stand any amount of rough wear. The double crank movement makes it very speedy.

As illustrated 27/-
THE METEOR, a larger size 34/6

OBTAINABLE FROM ALL GOOD TOYSHOPS

Sole Manufacturers:

LINES BROS. LTD., 9, FORE STREET, LONDON, E.C.2

An Open-Air Life this Summer!

GAMAGES

There is nothing like the open air for sheer enjoyment. Spend all the time that you can outdoors this Summer. Look at the dozen and one things you can do outdoors—Cycling, Photography, Camping—there's no end of suggestions at Gamages. Order to-day the splendid things we show below. You'll agree that you have never spent money better.

Going Touring?
Ride a Gamage Popular!

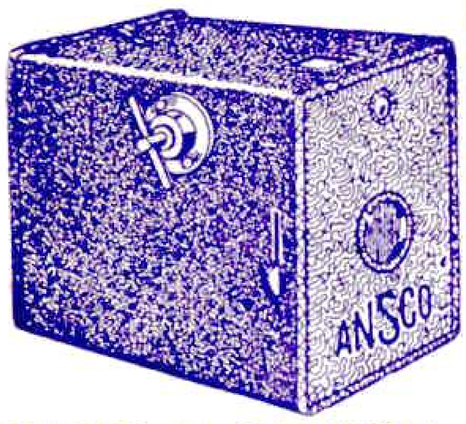
Let this splendid bike carry you smoothly, trouble free, through the glorious country side. Finished with one coat of rust preventor, three coats of finest black enamel and lined in two colours. Complete with tool-bag, 2 spanners, oil can, pump and pump clips. Price **£4 19 9**

10/- down secures delivery, balance being payable in 10 monthly payments of **10/-**

HANDY TOURING BAG

Size 14×8×5 in. Made in Double Texture Motor Hood Cloth with outside end pocket and leather handle for carrying. Can also be carried on handlebar, top tube of machine or behind saddle. Post 6d. **8/-**

Order by post from this advertisement. Everything we sell comes under our famous money-back guarantee.



TAKE A CAMERA On Your Holidays

Gives splendid pictures, 2½ by 1¾ (standard vest-pocket size film). Covered leatherine. Simple to load in daylight. Weight 8 ozs. Price **7/-**

Films **1/2** per spool of 8 (any make).

Sundial & Compass

As illustrated. Polished hardwood base and lid, 2½ in. diameter. Very easy to use, convenient for the pocket. Post free. Each **1/-**

Order NOW

The Shoe You Want NOW

They can be doubled to fit in your pocket, without fear of cracking, are extremely light, cool to wear and do not hurt the feet. Made in white, black, brown and mottled grey uppers, they will outlast three pairs of ordinary plimsols. We call them "Winrubers." Boys' sizes 7-10, **5/6**. Youths' sizes 2 to 5 **7/4**

Get this YACHT

The fascinating hobby of thousands of men and boys from the man with the racing yacht to the young beginner who has just launched his first model in the local pond. This model which we show is just the model which the fellow just starting needs. It is well finished, of the cutter pattern.
12 ins. long
Post free. Price **4/11**
Larger sizes
7/3 10/6 14/0

Every fellow wants a pocket knife—here's one at the right price. Fine quality pocket knife in White, Stag or Imitation Pearl, 4 blades (3 ordinary and 1 nail), ivorine handles, brass lined, capped ends. Length 3½ in. Post free. Price **2/3**

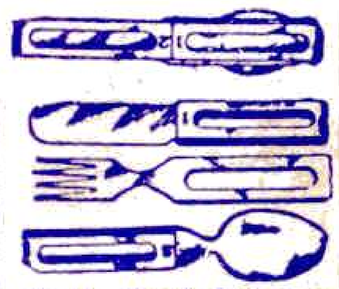
Your Camping Holiday!

Go Camping this year, but make sure that your holiday is unspoiled. Use only the best equipment, it costs no more than cheap kit if you come to Gamages for it.

Paraffin Stoves

Reliable Wickless Paraffin Oil Stoves. Give powerful blue flame & intense heat. Will *boil a gallon of water in* 10 *mins.* Heavy gauge roarer burner. Price each **10/6** Carriage free.

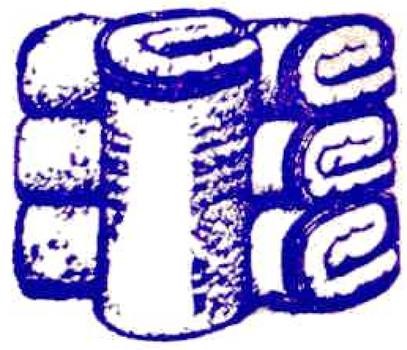
New Scouts Billy



In one. A perfect boiler, roaster, drinking cup and plate. Note the sliding handle to frying pan. Every part fitted together and packed into a useful, neat, compact and perfect Billy-can Postage 6d. **1/10**

Knife, Fork & Spoon

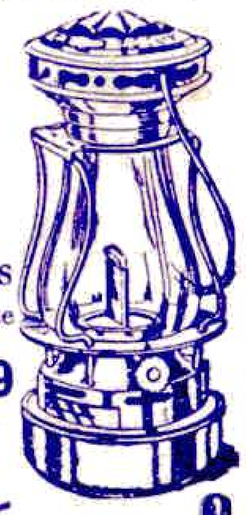
All in one. Just think of all the space it saves in your kit bag. Best nickel plate. Post 3d. **3/11**

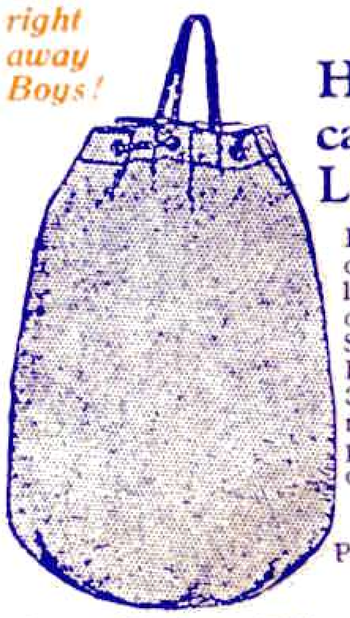


Warm Camp Blankets

Fine blankets that you will appreciate during cold nights at camp. 80" × 60", grey and brown. each **6/9**

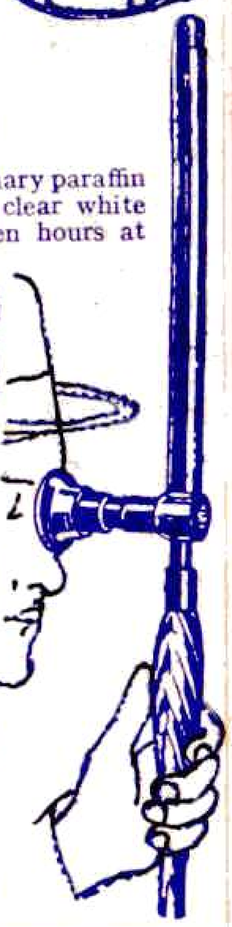
Order right away Boys!





Hurricane Lamps

Burns ordinary paraffin oil with a clear white light for ten hours at one filling. Size 7½ ins. high and 3½ ins. diameter. All parts easy of access. **3/6** Postage 6d.



Get Your Kit Bag!

Don't delay, camp isn't far off. Strong white canvas Kit Bag as illustrated. Post 4d. **2/11**

For Fun at Camp

Get a Periscope, grand things for field days, manouvres, etc., 22" long. Ex-Govt. stock, originally 42/-. Handle unscrews. Post free. **5/-**

A. W. GAMAGE LTD., HOLBORN, LONDON, E.C. 1.

City Branch: BENETFINKS, CHEAPSIDE, E.C. 2.

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